THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XI. No. 242—14th YEAR.] LONDON, JANUARY 28, 1862. [Subscription per Ann. 15s. in Advance 18s Credit.] DOUBLE No Price 1s.

CANNEL COAL.

RAMSAY'S NEWCASTLE CANNEL has become the principal Cannel Coal used in the Metropolis. Its joint products of gas of high illuminating power, and coke of good quality, make it one of the most economical coals known. The Crystal Palace was lighted from it in 1851, and the Post-office, and *Times* Office, are at present.

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Manufactory established in 1804.

GASLIGHT AND COKE COMPANY.
OFFICE, HORSEFERRY ROAD, WESTMINSTER.

NOTICE is hereby given that the office of SECRETARY to this Company will become vacant by the retirement of the present Secretary at Lady Day next, and the Court of Directors are ready to receive the applications of Candidates to fill the vacancy, until Saturday, the 8th day of February next.

Testimonials not required in the first instance.

Particulars, respecting the duty of the situation, and the amount of security which will be required, can be seen on application at this office.

By order of the Court of Directors,
January 25, 1862. C. BURLS, Secretary.

AS Working Foreman or Manager in a Gas-Work. The Advertiser has had great experience in both Interior and Exterior Fittings, and is acquainted with the various Apparatus connected with Gas-Works. First-rate references can be given.
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WANTED, a good Second-Hand 8-inch or 10-inch CENTRE-VALVE.
Apply, stating Price, &c., to Mr. J. W. LACEY, Gas-Works, HEREFORD.

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THE County and General Gas CONSUMERS COMPANY (Limited) are desirous of purchasing or leasing GAS-WORKS on equitable terms.

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JOSEPH COWEN and CO.,
BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,

Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS RETORTS and OTHER OBJECTS in FIRE CLAY."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire Bricks, and every other article in Fire Clay, are promptly executed at their Works as above.

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Coal and Coke Office,
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FIRST PRIZE IN THE PARIS EXHIBITION.

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Original Manufacturers of Wrought-Iron Gas Tubes and Holders of the present Patents; Inventors and First Makers of LAP-WELDED FLUES for Steam Boilers.

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Gun Metal, and all other kinds of Cocks, Stocks, Dies, and Taps, Galvanised Tubes, &c.

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FOR SALE, a Telescopic Gasholder, about 53½ ft. diameter, by 24 ft. in depth, having a working capacity of about 50,000 cubic ft.

Also, Two SINGLE-LIFT GASHOLDERS, each about 33 ft. diameter by 18 ft. in depth, and each having a working capacity of about 15,000 cubic feet.

These Gasholders have Guiding and Counterbalancing Apparatus complete, are now at work, and in excellent condition.

Apply to W. ESSON, Engineer, Gas-Works, CHELTENHAM.
Dec. 27, 1861.

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WILLIAM COCHRAN CARR begs most respectfully to thank the Metropolitan, Provincial, and Continental Gas Companies for their patronage for several years past, and to intimate that he has rebuilt and enlarged his extensive premises for the Manufacture of CLAY RETORTS; and that he is now prepared to execute the largest orders with punctuality and despatch. Orders for FIRE-CLAY RETORTS, of all shapes and sizes, FIRE-BRICKS, and all other Articles in Fire-Clay, executed on the shortest notice, and on the most reasonable terms.

London Agents:
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TO GAS ENGINEERS.

THE Directors of the Worthing GASLIGHT AND COKE COMPANY, having entered into a renewed Contract with the Worthing Local Board of Health for the public lighting of the Town, are desirous of letting the Gas-Works upon Lease for Seven Years from the 1st of July next.

The particulars of the terms of the Lease, together with other information, will be given on application to the Secretary.

Sealed Tenders for a Lease, with the names, &c., of two substantial Sureties, will be received not later than Tuesday, the 4th day of February, 1862, addressed to the Secretary, Mr. PATCHING, 14, High Street, WORTHING, and endorsed, "Tender for Leasing Worthing Gas-Works."

The Company do not bind themselves to accept the highest or any Tender.

THE Malta and Mediterranean Gas COMPANY (LIMITED).—MANAGER of Works at Malta WANTED.

Applications for the above appointment are invited from duly qualified parties. Every information can be obtained at the Offices of the Company, 30, CORNHILL.
E. P. BOWSELL, Secretary.
Jan. 25, 1862.

WANTED, by a respectable Youth, aged 18, a situation at the GAS-FITTING. Has had three years experience, and is thoroughly acquainted with all branches of the trade.
Address, C. SMISTON, REDDITCH.

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MAKERS—J. RATTRAY AND CO.,
RATTRAY'S GAS-BURNER MANUFACTORY,
RUTHERGLEN BRIDGE, GLASGOW.

THE IMPERIAL IRON TUBE COMPANY,
(SUCCESSORS TO GEORGE B. LLOYD & CO.,)
GAS STREET AND BERKLEY STREET,
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Manufacturers of Wrought-Iron Tubes and Fittings,
FOR GAS, STEAM, AND WATER,
PATENT GLASS ENAMELLED AND GALVANIZED TUBES,
AND
LAP-WELDED IRON BOILER TUBES.

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ESTABLISHED 1840.
JOHN EUNSON & SON,
Gas Engineers, and Manufacturers of Clay Retorts
AND FIRE GOODS IN GENERAL,
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Retort Mouthpieces, Bolts, Nuts, and every description of Wrought-Iron Work.

JOURNAL OF GAS LIGHTING NEWSPAPER
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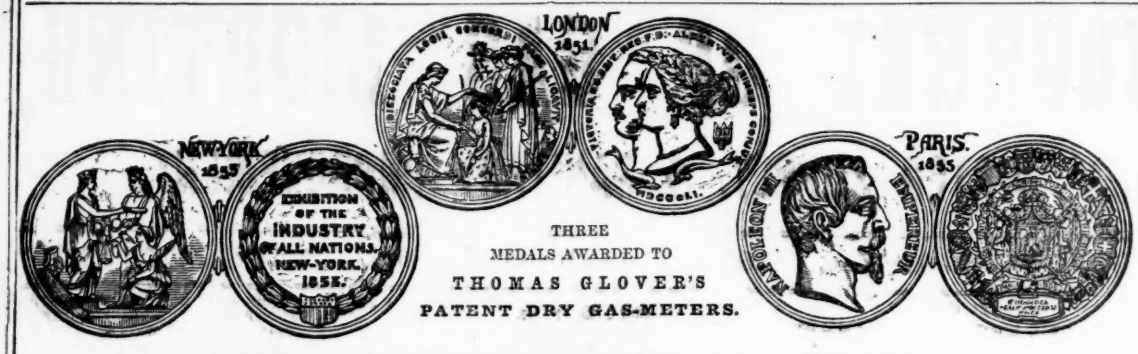

THREE
MEDALS AWARDED TO
THOMAS GLOVER'S
PATENT DRY GAS-METERS.

LORD REDESDALE'S "SALE OF GAS ACT."

DRY METERS *VERSUS* WET METERS.

LONDON, February 25, 1861.

THOMAS GLOVER begs to call the attention of Gas Companies and others to a few *facts*, which, if duly considered, must lead to most important conclusions:—

1. That since THOMAS GLOVER commenced to manufacture his Patent Dry Gas-Meters (which is now upwards of 15 years), every Wet Meter Maker of any importance in England has been compelled to manufacture Dry Gas-Meters; and in the JOURNAL OF GAS LIGHTING, of date of 12th of February, 1861, Messrs. William Parkinson and Co., successors to the late Samuel Crossley, advertise that they "intend manufacturing *Dry* as well as" Wet Meters, and it is worthy of particular notice that they intend to do so "after 40 years experience in manufacturing Wet Gas-Meters of such a quality that has enabled them, as they say, to maintain a superiority over all other; and this, be it also particularly noticed, after they had advertised in the JOURNAL OF GAS LIGHTING, January 29, 1861, "their improved low-spouted Gas-Meter with new patent float arrangement, which entirely overcomes the difficulty experienced by ordinary Wet Meter."

2. That it is quite consistent with THOMAS GLOVER'S knowledge that Wet Gas-Meters, called "low-spouted" or "compensating Wet Meters," have already been proved to be incapable of continuous working or registration, and for this reason the manufacturers of these Meters have been induced to seek the repeal of Lord Redesdale's (righteous) Sale of Gas Act.

3. That every year the Patent Dry Gas-Meter manufactured by THOMAS GLOVER has risen in favour with Gas Companies and Gas Consumers, placing him in the proud position of being the largest manufacturer of Gas-Meters in the country.

THOMAS GLOVER guarantees his Patent Dry Gas-Meters to meet all the requirements of the "Sale of Gas Act," to give accurate and unvarying registration with steady lights; and, from their peculiar construction, cannot be tampered with, and may be fixed in open situations even above or below the level of the lights. They work with less pressure than Wet Meters, and are not affected by the most severe frost.

THOMAS GLOVER guarantees to uphold all Meters sold by him for 5 years free of expense to the purchaser, or for a trifling per centage per annum will contract with any Gas Company to uphold their Meters of his manufacture for a series of years; and, at the conclusion of such contract, to leave the Meters all in perfect working order.

N. B.—Agents in several parts of England are wanted. Apply by letter, or personally.

WILLIAM PARKINSON AND CO.

(SUCCESSORS TO SAMUEL CROSLEY),

PATENT WET AND DRY GAS-METER MANUFACTURERS, &c.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

PATENT IMPROVED WET METER.

W. P. and Co. invite especial attention to this Meter, which entirely overcomes the difficulty to which ordinary Wet Meters are subjected, owing to the short range of the Float, which is necessary, in order to meet the requirements of the Sale of Gas Act.

"It is well known that in Meters constructed so that the valve will close when the water is drawn off to such a point as to render them 3 per cent. slow the lights are liable to be extinguished by the closing of the valve by a sudden increase of pressure. To meet this difficulty, Mr. Pinchbeck has invented an ingenious and simple arrangement by which the action is reversed, and any such increase of pressure, in his Meter, raises the value instead of depressing it. The fact of the improvement having been adopted by Messrs. W. Parkinson and Co. is a sufficient guarantee that it practically and effectually remedies the inconvenience it is designed to meet."—JOURNAL OF GAS LIGHTING.

PATENT IMPROVED DRY METER,

Which W. P. and Co. pledge themselves to manufacture with the same quality of materials and workmanship as in their Wet Meter, thereby giving Gas Companies and others the advantage of procuring a first-rate Dry as well as a Wet Meter, which, hitherto, they have been unable to do.

STATION-METERS AND GOVERNORS,

Which can be seen at all the London Gas-Works. Also Liverpool, Manchester, Sheffield, Nottingham, Belfast, Glasgow, Birmingham, Dublin, Bristol, Leeds, Leicester, Brighton, Southampton, Sunderland, Wolverhampton, Bradford, Norwich, &c., &c.

TEST GASHOLDERS, EXPERIMENTAL METERS, EXHAUSTER REGULATORS,

MINUTE CLOCKS, PRESSURE GAUGES, PHOTOMETERS, PRESSURE REGISTERS, &c.

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NOTICES.

Subscribers who have not paid their subscriptions for the year 1861, or for any previous years, are requested to remit the same forthwith, in the manner indicated below, in order to prevent any interruption in the regular delivery of the JOURNAL; and such subscribers as desire to avail themselves of the reduction in the subscription by paying in advance, must do so in the course of the month of January.

The subscription is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders must be made payable at the Charing-Cross Money-Order Office, to William H. Bennett, No. 42, Parliament Street, Westminster.

The next number will be published on Tuesday, February 11, and the subsequent numbers on each successive alternate Tuesday.

Stamped copies, when forwarded by post, must be folded so as to expose the stamp; they are otherwise liable to the full postage charge for letters.

This JOURNAL has been duly registered at the General Post Office for transmission abroad.

All Communications to be addressed to the Editor, No. 42, Parliament Street, Westminster; and orders for Advertisements to the Publisher, Mr. W. B. King, No. 11, Bolt Court, Fleet Street.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 28, 1862.

Notes upon Passing Events.

THE old question of the manurial value of the sewage is about to be discussed with more zeal than ever in the Metropolitan Board of Works, where a number of gentlemen, coming fresh to the subject, seem prepared to accept all the fallacies of the sewage-manure maniacs of Mr. Edwin Chadwick's school. It is more than twenty years since that an extremely clever man, Mr. Smith, of Deanston, whose improvident habits compelled him to become the subaltern of officials very much his inferiors in a scientific and practical point of view, suggested that a profit might, under certain circumstances, be obtained from collecting and using the sewage of towns systematically drained. This was an extension of another idea of Mr. Smith's, which turned out to be futile in practice—that useful power for agricultural purposes might generally be obtained from the water drained from agricultural land. Mr. Chadwick and his subalterns seized Mr. Smith's suggestion for making profit out of sewage, and used it very effectively for inducing divers towns to adopt the Board of Health plans of drainage. It was one of the fixed instructions of the inspecting engineers, that they should inquire and report in every case on the best method of utilizing the liquid sewage; and for this purpose they were ordered to insist on one outfall for the whole sewage, quite irrespective of the conformation of the land on which the town stood. Great sacrifices were made to obtain this one outfall; in the course of twenty years, in no case has any one of the towns drained on Mr. Chadwick's Board of Health plans, or on any plans, obtained a profit from the sale of its sewage. In three instances only has the sewage been utilized; at Rugby, where the expenses of delivery have far exceeded the rent received—£50 a year—and where a tenant who had long occupied the sewage-manure farms, found the system, on the average of seasons, unprofitable; at Watford, where a patriotic nobleman carries on a fancy farm, the profits of which, as on all other noblemen's farms, are a matter of grave doubt with real farmers; and at Carlisle, where the sewage is deodorized before being distributed, in water meadow fashion, over grass-land. It has often been pointed out, that while during the twenty years all the official engineering and literary influence of Mr. Chadwick's school have failed to find a market for liquid sewage, and a long list of natural and artificial manures have acquired a large sale—the demand, at a price, for guano, nitrate of soda, and raw bones is practically unlimited; the sale of coprolites is steady; the search for apatite (Mr. Lawes has the monopoly of the one known supply) is unceasing; and then, for the artificial manures for wheat, barley, turnips, and mangold, which are compounded of guano, superphosphate, coprolites, blood, and other nitrogenous substances, and sold by such manufacturers as Mr. Lawes, the London Manure Company, the Nitro-Phosphate Company, Messrs. Prior, of Birmingham, Messrs. Dixon and Cardus, of Southampton, and Messrs. Ramsay, of Newcastle-on-Tyne, the demand is enormous, and the sale limited only by the price, which also is limited by the supply of the raw material. The fact is, that the effect of these easily stored, easily carried manures, is certain, and very rarely affected by seasons if properly applied. But liquid sewage is difficult and expensive to store, expensive to convey, and only valuable for certain grasses, at certain seasons; it is invaluable in a dry season, ruinous in a wet one. For these reasons, it was wisely decided that the Metropolitan Board of Works should not meddle with irrigating or cultivating projects, but should deliver the sewage of London where it was not likely to be a nuisance, and rely on private enterprise for tapping and making use, if possible, of the contents of the reservoirs on either bank of the Thames. There were plenty of amateurs to tell the Board that they were throwing away a perfect Pactolus of wealth; but wiser councils prevailed, and the plans of the Board were confined to getting rid of an intolerable river of filth.

As the main drainage works are in such a state that the date of their completion may be foreseen, the Board have very properly invited any parties desirous of utilizing their sewage to send in their plans. We have before us the report of a committee appointed by the Board to examine these plans. They are not numerous; they are extremely vague; and, with one exception, none of them seem advanced beyond the stage of a blank prospectus, without capital or names of influence. The directors of the London Sewage Utilization Company propose to take as much of the sewage of the outfall sewer on the North side of the river as they shall require and be able to employ, for a preliminary term of two years, at a rental of £5 per annum, with the view of renewing the lease, for twenty-one years, at the end of that time, if the speculation should prove profitable. This company does not seem to have any capital raised, or any distinct idea of how the sewage is to be employed. Mr. John James Moore proposes to take all the sewage of the metropolis, for fourteen years, at a pepper-corn rent; and then, for the remainder of a term of ninety years, to divide the profits from the sale of the sewage, after deducting 10 per cent. on account

of the capital invested. But he seems to have neither capital, nor company, nor plan. Mr. George Shepherd, a civil engineer of some reputation, proposes, on behalf of a company *to be formed*, to take the sewage of London for agricultural purposes, for a term of fifty years, dividing the profits in certain proportions. Mr. Thomas Ellis, builder and contractor, who has explained his plans in detail in a pamphlet, *proposes*, to form a company, and that this company shall take "the sewage of London from the reservoirs of the outfalls, and raise it by pumping to elevated positions on both sides of the river, with a view to distribute it from thence for agricultural purposes—*the sewage*, previous to its application to the land, being freed from offensive smell if the Board shall so require. The proposed company to receive a preference dividend of £5 per cent. on their paid-up capital; the remainder of their receipts to be divided between them and the Metropolitan Board. Finally, there is a proposition from the Hon. William Napier and Mr. Hope, which we shall presently describe in detail, because it is the only real proposition, backed by detailed plans, which has been presented to the Board. The London Sewage Manure Company ask for two years to ascertain whether they can raise capital, and find a way of selling the sewage. Mr. Moore gives no information as to his means or plans. Mr. George Shepherd, C.E., has, or had, a company for utilizing the sewage of Croydon, which promised to do wonderful things—Croydon was one of Mr. Edwin Chadwick's model towns, drained under the control of a board of health, over which Mr. Cuthbert Johnson, F.R.S., one of Mr. Chadwick's most devoted friends, presided, until he had exhausted the patience and the funds of the town in unsuccessful experiments—but the people of Croydon do not seem to have much faith in Mr. Shepherd's utilization plans, for we find that the local board of health have a Bill in Parliament for power to discharge a portion of the sewage of the parish into a sewer constructed by the Metropolitan Board of Works; and the Vice-Chancellor has just granted an injunction to Mr. Bidder restraining the Croydon Board of Health from pouring sewage into his trout stream. Mr. Shepherd is a clever man, but he must produce tangible proofs at Croydon, before he will be likely to find capital, or obtain permission, to deal with the sewage of London. Mr. Ellis has satisfied the worst wishes of his enemies, if he has any, by writing a book, with a title-page as comprehensive as a preface, in which he promises "to place at the disposal of the Board of Works, for the reduction of local taxation over the metropolitan area, an annual sum of not less than £700,000." It is a small objection to this scheme, that Mr. Ellis—Alnaschar Ellis, would be his proper name—has no company and no capital to carry out his scheme, because, if he could only find customers for the article at the price he fixes, the capital would soon be forthcoming. One of Mr. Ellis's authorities is, "that eminent agriculturist, Mr. Mechi;" but, even Mr. Mechi's calculations of profit (and their absurdity has been demonstrated a dozen times) are not sufficient for his scheme. Mr. Mechi estimates the value of liquid town sewage at 1d. per ton, and two thousand tons as equal to a ton of guano—not that the alderman meant anything of the kind; as a first-rate and most intelligent tradesman, he knows that

> The value of a thing
> Is just exactly what 't will bring;"

and that, from the Land's End to John o' Groat's, he could not find a dozen farmers ready to buy sewage regularly at that price, or at any price. He knows, too, that neither two thousand nor ten thousand tons of liquid sewage will produce the same effects on corn-crops—the most profitable of crops—as a caustic portable manure like guano; and he makes these theoretical statistical calculations to amuse and astonish people who know nothing of agriculture except what he tells them. But Mr. Ellis will not be content with less than 2d. per ton; and having, like Alnaschar of the "Arabian Nights," secured that sum for all the sewage of London, he has no difficulty in making out a balance-sheet showing a profit of £700,000 for the benefit of the Metropolitan Board. He may as well charge his imaginary customers 4d., and then there will be for his next title-page the round sum of £1,400,000. And yet there will be found in the Board people ignorant enough of the past history of the question to believe this stuff, and silly enough to quote it. The example of the worthlessness of sewage, diluted with the modern supply of water, is to be found at Brighton. A well-known farmer formerly paid five or six shillings a load for the solid contents of cesspools; the town of Brighton, now amply supplied with water, would willingly pay him as much if he would take the diluted stuff away. All attempts to utilize the Brighton sewage on the chalk downs, have been defeated by the pumping expenses.

With respect to the scheme of Messrs. Napier and Hope—in the first place, it is to be presumed, from Mr. Napier's position as managing director of the Land Draining Company, that he has not brought a Bill into Parliament, and raised £70,000 to deposit, without having provided for obtaining the capital on better security than the concession of the sewage. As for the scheme, it is detailed at length in plans which have been duly prepared and deposited by an eminent engineer, Mr. G. Hemans, and described in a Bill now before us, under the title of "Metropolis Sewage and Essex Reclamation." The parties names in the Bill as promoters are the Honourable Henry William Petre, the Honourable William Napier, John Horatio Lloyd, and William Hope. They propose, by embankments, and other means, which have for centuries been successfully employed in the Netherlands, and on our own East coast, to reclaim "about twenty thousand acres from the Foulness Sands and the Dengie Flats on the Essex coast," which are now in great part covered with water at high tides. And they also propose to raise the depth of the soil and stimulate the productive powers of these reclaimed lands by irrigating them daily with 10 million cubic feet of sewage from the North metropolitan area. This sewage to be used only at the times when it is most likely to be offensive, viz., during dry weather. When much diluted by rainfall, it is to be allowed to flow away at Barking Creek. The capital required for this work of reclamation and distribution of sewage, is set down at two millions. The first and greatest advantage of this plan is, that without cost or risk to the Board, it consumes the sewage at the times when it is most likely to be a nuisance to the river, and pours it upon exactly that kind of porous soil which experience has shown to be not only most capable of deodorizing sewage, but of deriving benefit from it. These Essex Flats when reclaimed can annoy no noses except those of the labourers engaged on them; and, judging by the experience of the Edinburgh meadows, they will probably after a time grow at least fine crops of grass. Of course, the sewage of London will not be equal in strength to the sewage of Edinburgh—it is much more diluted with water, and will roll through miles of sewers, and be pumped up heights to flow down again, and all the while the chemical action of air and water will be going on. But that is the affair of the company, that is their risk. They are ready to stand the loss if any, and to make the following division of profits, if any. "All net profits realized by the company over 10 per cent. on their whole outlay, to be equally divided between the company and the Metropolitan Board. If the company make sales of the redeemed land, realizing more than the original cost of their whole works together, with the 10 per cent. per annum profit, all profit above the sum so obtained, to be divided between the company and the Board. The term of lease of the sewage to be for fifty years; the Board to have the right to take, on giving seven years notice at the end of fifty years, the whole of the company's works and land at a valuation, not below the original cost." It is proposed, by Mr. Hemans, to convey the sewage to the reclaimed land by a brick culvert, ten feet in diameter, from the main intercepting sewers at Abbey Mills pumping-station, to the river Crouch, a distance of thirty-seven miles; thence two open branches, each seven or eight miles in length, are to diverge and convey the sewage on the reclaimed lands. In the line of the brick culvert, is to be a lift of about thirty feet, with a pumping-establishment of about 1000 horse-power. The mere attempt to drain 20,000 acres, is one deserving of every kind of public encouragement, short of voting public money. But, above all, this is a complete plan, the execution of which depends on the promoters, and not on the chance of finding farmers ready to give a penny or twopence a ton all the year round, for what no farmer in this climate ever paid yet.

The Brighton Town Commissioners have a Bill in Parliament for leave to raise £30,000, and spend it in building *abattoirs*—that is, slaughterhouses—and, as soon as they have built these *abattoirs*, no butcher in Brighton or Hove is to be allowed to kill cattle, sheep, or pigs, anywhere else. The name and the plan are both taken from France; and, as a broad general principle, nothing can be more unsuitable to English meat or English habits. English meat is fat and juicy, and very soon spoiled in warm weather if moved about;

French meat is stringy, fatless, hard, and can bear a great deal of ill usage without being any the worse for it. English cookery is simple, and deals with large joints, so that a fresh condition is essential; French cookery is compound, necessitating cutting meat into small lumps, and so disguises it that a little more or less freshness is of very little consequence. If you want to have meat in perfection, it cannot be moved too little between the time of slaughtering and reaching the larder or kitchen. Before public attention was directed to the subject, butchers in London and elsewhere often had their slaughterhouses in very unfit places, and of very unsuitable construction. But there is no reason why butchers' slaughterhouses should not be kept as clean and free from smells as a first-class stable. The plan adopted in London of licensing and inspecting the slaughterhouses belonging to private butchers answers every sanitary purpose, and has none of the disadvantages of public slaughterhouses. It is necessary that there should be sufficient space, ventilation, and drainage; it is also necessary that frequent inspection should be enforced, to prevent any accumulation of offal. In the present day, there is a demand for every part of a beast, or sheep, or pig. What is not required for edible consumption or tanners, or horn manufacturers, or glue makers, is eagerly taken up by the manufacturers of artificial manure. Therefore, a very little inspection is sufficient. With a suitable building, and an ample supply of water, a slaughterhouse, an hour after killing, may be as clean as a kitchen. But, after a town has gone to the expense of building *abattoirs*, and maintaining a staff to keep them in order, it will be found that frequently, when the weather is hot or close, the meat will be seriously injured by the shaking it will receive while being carried to the distant shops. An intelligent engineer who studied the *abattoir* question, with the view of establishing one in Dublin, was obliged to plan in conjunction with it a complete alteration in all the butchers' carts of that city; joints were to be hung from hooks transversely, and not laid in heaps—a notion which could no more be worked practically than a law for regulating the boots and breeches of butchers. There may be local reasons for this Brighton *abattoir* scheme, although they are not visible to a stranger; but the ratepayers of that watering-place should take care lest the result should be worse meat, and dearer in addition to an *abattoir* rate.

We give the following "points" from the address of Mr. Hawkshaw on taking the chair as President of the Institution of Civil Engineers on the 14th of January:—

There is, I believe, no such thing as discovery and invention, in the sense which is sometimes attached to the words. Men do not suddenly discover new worlds, or invent new machines, or find new metals. Some, indeed, may be, and are, better fitted than others for such purposes; but the process of discovery is, and always has been, much the same. There is nothing really worth having, that man has obtained, that has not been the result of a combined and gradual process of investigation. A gifted individual comes across some old footmark, stumbles on a chain of previous research and inquiry. He meets, for instance, with a machine, the result of much previous labour; he modifies it, pulls it to pieces, constructs and reconstructs it, and, by further trial and experiment, he arrives at the long-sought-for result. . . . .

Great progress has also been made in the application of the screw-propeller to steam-ships, which, for vessels of war and other purposes, possesses advantages over the paddle, though it has not hitherto accomplished an equal speed.

In 1848, the fastest screw line-of-battle ship in the Navy could not steam more than about seven and a half knots, or eight miles and two-thirds per hour; whereas, the *Warrior*, though clothed with an outer coat of iron armour 4½ inches thick, at her trial in October last over the measured mile in Stokes Bay, attained an average speed of 14·356 knots, or 16·533 miles per hour, beating the *Howe*, which previously had attained the highest trial-speed of any of Her Majesty's line-of-battle ships. . . . .

That war-steamers and other steam-ships can be made stronger, and may be made to steam faster than they yet have been, there is no doubt. No one can have taken the trouble to examine the present methods of building without seeing that it is easy to increase their strength without impairing their efficiency in other respects. . . . .

In a very few years, mainly in consequence of the labours of Sir William Armstrong and of Mr. Whitworth, the range of artillery has been doubled. The weight of the gun, in proportion to that of the projectile, has been reduced to one-half, and the capacity for powder of the elongated, as compared with the round shell, has been more than doubled. This great advance in the destructive power of cannon has rendered most of our old fortifications useless. New fortifications have therefore to be built, adapted to the longer range and greater destructive power of the new artillery. These fortifications require to be placed more in advance of the places to be defended, and to be constructed with very superior powers of resistance to those which hitherto have proved sufficient. The old walled towns, which were formidable enough in former days, would to-day, in case of a siege, afford little security to the inhabitants who dwell within them; the old defences, therefore, have to be removed, and replaced, where necessary, with those more suitable to modern requirements. . . . .

There are some cases in which forts may with advantage be principally, if not wholly, built of iron. I hope to see that material adopted for the superstructure of the large sea-forts at Spithead, the construction of the foundations for which has been intrusted to me. There can, I think, be no insuperable difficulty in constructing iron forts so as to be impregnable to a ship's battery, though, in the absence of knowledge as to what may be the ultimate powers of guns, it is not easy at present to arrive at safe conclusions. The difficulty of doing the converse of this—viz., of building ships so as to be impregnable to the fire of such artillery as may and ought to be placed in the new forts—will be a problem not so easily solved. . . . .

Should it turn out that steel, or homogeneous iron, as it is sometimes termed, uniform in quality, and of double the strength of ordinary iron, can be manufactured in large quantities at a moderate price, and can be easily manipulated, then many things that are now with difficulty accomplished will be greatly facilitated, and some things which cannot be done at all will be rendered practicable.

Bridges of greater span could be constructed. Screw-shafts, crank-axles, and other parts of steam-engines, at present of unwieldy size, would by its use be reduced to more moderate dimensions. There seems to be no limit to the size of guns, except that of the strength of the material, and the power of welding, forging, and handling them. . . . .

We are, I believe, in the infancy only of discoveries in the improvement of the manufacture of steel and iron. Until lately, the nature of the demand for iron rather retarded than encouraged improvements in its manufacture. Railways consumed iron in vast quantities, and railway companies cared nothing about quality. They were driven to seek a tolerably good material for engine and carriage tyres, but, as it respected the vast consumption in the shape of rails, they were implicitly guided by the lowest prices. As long as this system continued, it suited the ironmasters to manufacture a cheap article in large quantities, and they therefore gave themselves no concern to establish a better state of things. But heavy engines, high speed, and an enlarged traffic are gradually working a change. We are beginning to find that iron of the very best quality has hardly endurance enough for rails or locomotive tyres; that there is no economy in putting down rails which require taking up again in a year or two; and, in short, that the increased strains arising from the accelerated motion of railways, steam-boats, and machinery generally, are necessitating a better material. . . . .

Having noticed some of the advantages that may flow from a greatly improved quality of iron, or a cheap manufacture of steel, or of a metal approaching steel in character, I may call attention to the great facilities that have arisen from the use of iron cylinders in sinking and securing foundations.

Before this invention, masonry built under water had to be performed by divers with helmets, or by means of diving-bells. That mode of construction does not admit of the best work. The stones are laid without mortar, and depend for their security on their large size, and on a good arrangement of bond. . . . .

But the use of iron cylinders not only admits of masonry or brick-work being built in mortar under water in any form, and in any bond, but enables the engineer to excavate under water, and to examine the ground before he begins to build, and to proceed with his work with as much deliberation, method, and security, and almost with as little delay, when 70 or 80 feet below the water-level, as he can do on dry land. . . . .

In 1841, a patent was taken out for "improvements in the means of, and in the apparatus for, building and working under water;" and, soon after the construction of the Rochester bridge, where cylinders were sunk under air-pressure, an action was brought against Messrs. Fox and Henderson, the contractors for the bridge, for an infringement of that patent. I happened to be engaged on that trial, and the fact was then brought to light that, many years before, the late Earl Dundonald (then Lord Cochrane) had taken out a patent for a similar purpose, very perfect in most of its details; for the drawings attached to Lord Cochrane's patent showed an air-lock almost identical with that now in use, and contained all the necessary arrangements for success. Lord Cochrane proposed to use it for overcoming difficulties similar to those encountered in the execution of such works as the Thames Tunnel; he proposed, in fact, to excavate such works under air-pressure.

This is another instance of the fertility of mind of that extraordinary man, who, great as he was as a sailor, would probably have been equally eminent as an engineer; and I here offer, as a tribute to Lord Dundonald's memory, this recognition of his early attempts to introduce the important system to which I have just been referring. . . . .

At present, it seems improbable, so long as motive power is to be obtained through the intervention of heat, and until a cheaper fuel than coal can be found, that the steam-engine will be superseded by any other machine.

Electric-magnetic machines are perhaps the least likely of all inventions to supersede the steam-engine. The consumption of a grain of zinc, as Mr. Joule has shown, though much more costly than a grain of coal, does not produce more than about one-eighth of the same mechanical effect.

It would not, however, be at all safe to predict that considerable improvements may not yet be made in the steam-engine, or in engines to be worked by coal.

The consumption of fuel in the best steam-engines has been reduced to 2½ pounds of coals per horse-power per hour; but such an engine does not utilize one-fifth part of the absolute mechanical value of the coal consumed; and, so long as this is the case, it would be unwise to assume that we have attained the utmost limits of improvement. . . .

Having thus touched upon the several points that occur to me as deserving of notice, I will conclude by remarking that no man can look back on the last twenty or thirty years without feeling that it has been the age of engineers and mechanicians. The profession to which we belong has, in that period of time, done much to change the aspect of human affairs; for what agency, during that period, single or combined, can be compared in its effects, or in its tendency towards the amelioration of the condition of mankind, with the establishment of railroads, of the electric telegraph, and to the improvement in steam navigation?

For, in constructing railways, telegraphs, and steam-boats, and their adjuncts, docks and harbours, and moulding and fashioning the face of the material universe to the wants of man—in overcoming its barriers, overleaping its valleys, and spanning its seas—engineers annihilate both space and time, bring into juxtaposition nations and people, and accelerate, beyond all human expectation, personal communication, and that interchange of ideas which is all important to the advancement of civilization and knowledge.

Circular to Gas Companies.

THE comparatively settled state of gas matters in the metropolis having given Mr. Hughes some leisure time, that indefatigable agitator is directing his attention to the provinces, and he has tendered his disinterested services to the provincial authorities, to aid them in compelling the gas companies to

supply the public lamps at a cheaper rate. With the view of ferreting out places where a plausible grievance may be concocted, he recently issued a circular to the clerks of the local authorities throughout the kingdom, of which the following is a copy:—

[A]

14, *Park Street, Westminster, S.W.*, 186 .

Sir,—I am about to publish a continuation of the tables relative to public lighting, which were issued in September, 1859, by the managers of the Metropolis Gas Inquiry, and shall be extremely obliged if you will favour me with answers to the following questions as to the public lighting in .—I am, sir, your very obedient servant,

SAMUEL HUGHES,
Formerly Engineer to the Managers of the Metropolis Gas Inquiry.

Questions.	Answers.
1.—Price paid for each public lamp per annum?	
2.—Do the lamps and posts belong to the town, or to the gas company?	
3.—Does the company light, extinguish, paint, and repair? . .	
4.—Number of hours per annum during which each lamp burns?	
5.—Cubic feet per hour consumed by each lamp as per contract?	
6.—Cubic feet per hour consumed—when this has been ascertained either by meter or by experiment?	
7.—Price per 1000 feet of gas to the private consumer?	

Appended to the foregoing circular is a copy of the information furnished to the managers of the Metropolis Gas Inquiry, in 1859, by the clerk of each town respectively; and it appears that, whenever his recent circular has not been replied to, Mr. Hughes assumes that the condition of gas supply remains the same as in that year. Being thus armed with returns, more or less accurate, from 150 towns, he proceeded to apply the information in a manner which surpasses all his former feats of illogical deduction and reckless misrepresentation, as exhibited in the following circular, a copy of which, in a lithographed form, has come into our possession. It was issued from the Gas Grievance Office, on the 4th inst., with the blanks duly filled up, and we presume that it has been sent to most of the town-clerks in the kingdom:—

[B]

14, *Park Street, Westminster, S.W., Jan.* 4, 1862.

Sir,—Having now obtained returns of lighting statistics from more than 150 towns in the United Kingdom, I have been enabled to make an extensive comparison of the price paid for gas supplied to the public lamps in with that paid in other places.

I find that the net price for the gas alone supplied to the public lamps in is per 1000 feet, while the maximum price to the private consumer is only .

Now, according to the average of the whole kingdom, the price for gas in the public lamps should be only per 1000 feet; so that, having regard to the price paid by the private consumer, you are charged per 1000 feet in excess of the average which prevails throughout the kingdom.

If the local authority in does not burn by meter, and employ their own men to light the lamps, there is no doubt that you sustain a further, and very serious loss, by being charged for a very much larger quantity of gas than the public lamps consume.—I am, sir, your very obedient servant,

SAMUEL HUGHES.

The Town-Clerk,

Had we not seen Mr. Hughes's signature attached to the foregoing, we could not have believed that he would have committed such an absurdity as to contend for a uniform price for public lighting in all towns in the kingdom, as the circular implies. Mr. Hughes's estimate of the reasoning powers of the local authorities in the provinces must be extremely low, if he conceives they can be misled by a proposition so manifestly opposed to common sense. It is possible, indeed, that the words of the circular express something different from what he intended to signify, for we can with difficulty suppose that he imagined the persons he addressed to be so ignorant as not to perceive at once the folly of maintaining that the price of gas should be the same in all parts of the kingdom. It may be, that Mr. Hughes meant to say that the price paid for public lighting in each case was higher, in proportion to the price charged to private consumers, than the average in the towns from which he had received information. His words, it is true, do not bear that construction, but we are inclined to give them that interpretation—otherwise, we must assume that Mr. Hughes has either lost his reason, or that he conceives all those whom he has addressed to have done so. Whatever may be the meaning of Mr. Hughes's circular, it has not met with that cordial reception which he no doubt expected. At Croydon, we are informed by a local paper, the board treated his "gratuitous advice" somewhat contemptuously, and it was considered the more worthless because "the writer had based his calculations on wrong data, having stated the cost of the public lights to be 4s. 9½d., whereas they cost only 4s. 4d." We know, from private information, of other instances in which his kind offers of assistance have been rejected, and the data of his calculations contradicted. Mr. Hughes has asserted that, according to his statistical returns, the average price paid for gas supplied to the public lamps is 25 per cent. less than to private consumers, and such proportion he contends ought to be observed in all the towns in the kingdom. That, if our interpretation of his circular be correct, is the dogma on which he is now endeavouring to found a system of provincial gas agitation. We have often exposed the fallacy of the plan of paying less for the public lights than is charged to private consumers, and this view was taken by Mr. Richards, the umpire in the recent arbitration case between the corporation of Waterford and the gas company. He well observed that, "to make the public gas cheap at the expense of the private, was to take money from one man to serve another; it was, in fact, robbing Peter to pay Paul." The charge for gas for the street-lamps cannot be reduced below a fair remunerating price without injury to the private consumer, who must be charged more to make up the deficiency. There is no reason whatever why the public lamps should be lighted for less than is charged to the largest private consumer, and the practice of making a difference arose from circumstances which should serve as a warning rather than be followed as a precedent. It originated in bribing local authorities, by that means to grant powers to competing companies to open the streets to lay their mains; and the result has, in nearly every case, been serious loss to the gas companies, whilst the consumers suffer by being charged a higher price for gas to pay dividends on two capitals instead of one. Now that the injurious effects of such competition are admitted—Mr. Hughes himself having been the principal agent in obtaining an Act wherein in it is declared to be expedient that competition in the metropolis should cease—it is a complete perversion of sound principles in the supply of gas to attempt to establish a distinction between public and private lights, which was wrongfully introduced by competing companies as a bribe to local authorities.

Though the phraseology of Mr. Hughes's circular leaves it doubtful whether the object of the new agitation be to enforce a uniform price of gas throughout the kingdom, or a distinction of 25 per cent. in favour of the public lights, the meaning of his last paragraph admits of no mistake. It is a direct charge of fraud against all gas companies, made in his usual reckless manner, without the least particle of ground whereon to rest it. He preferred a similar accusation against the metropolitan gas companies, in his evidence before the parliamentary committee, and, not abashed by the rebuff he then met, he now has the hardihood to assert that "there can be no doubt" that when the lamps are lighted by their own men, they "charge for a much larger quantity of gas than the public lights consume." The metropolitan gas companies were most anxious to refute this calumny in the committee of the House of Commons, but the chairman refused to hear vindicatory evidence, because, in the opinion of the committee, there was no foundation for that, or for the other charges alleged against them. Such was the estimate of the correctness of Mr. Hughes's testimony entertained by the committee; and the charge now reiterated against all the provincial gas companies is, we may venture to affirm, equally groundless. The accusation is so general that Mr. Hughes thinks, no doubt, it may be safely ventured. Were he to be more specific, he would find to his cost that a British jury would concur with the committee of the House of Commons in the value to be attached to his random, baseless assertions,

As arbitrator on behalf of the Local Board at Worthing, Mr. Hughes has had an opportunity of advocating his peculiar notions respecting the supply of gas. His co-arbitrator, on

behalf of the gas company, was Mr. Rutter, of the Black Rock Gas-Works, Brighton; and we are greatly surprised to find that a gentleman for whom we entertain a sincere regard, and of whose abilities as a gas engineer there can be no question, should have shown himself so far wanting in the qualifications of an arbitrator, as to have yielded entirely to the eloquence of Mr. Hughes. He has, indeed, conceded, and apparently without a struggle, all that the local board could have demanded; and he has consented to an award which places the company completely at their mercy. He has agreed that the charge for the gas to be supplied to the public lamps shall be 25 per cent. less than to private consumers; that the quantity consumed shall be estimated by four test-lamps, to be provided by the company, being one meter for 39 lights; that the test-lamps, as well as all the other lamps in the town, shall be lighted and extinguished by men in the employ of the board; and that a minimum pressure of seven-tenths of an inch of water shall be maintained in all the mains. In contrast with this extraordinary award, we have much satisfaction in placing that of Mr. Richards, the umpire appointed by the magistrates of the county of Waterford, to decide between the arbitrators in a similar reference at Waterford. Mr. Richards is the chairman for the county—an office corresponding with that of chairman of quarter sessions in England—and his appointment by the magistrates is a guarantee of his perfect impartiality. The question in dispute between the gas company and the corporation was the price for the public lamps, which the company had raised to £4. 8s. 6d., a sum the corporation refused to pay. The umpire said that, with regard to public lighting, he had found that the practice principally existing was this:—"Companies who were solely dependent on the support and powers of corporations sought to propitiate the public bodies by supplying gas for the public lights of a town at a price far below that charged to private consumers. This habit obliged him to consider whether the public lights ought to be lighted at a loss to companies." Such a practice, he thought, "could not be supported by any intelligent person;" and, in the case of Waterford, he declared that the corporation had required too much, and that the gas company had acted well and liberally. He, therefore, allowed the full amount, estimating the gas at the rate of 4s. 6d. per 1000 feet, the price charged to the largest private consumer. The principle that guided the umpire in his decision at Waterford will, we feel assured, be acted on in every arbitration case, when conducted on behalf of the companies with ability and firmness. The triumph of Mr. Hughes at Worthing is merely exceptional; and it is much to be regretted that Mr. Rutter should have yielded to all his demands without referring the matter to the decision of an umpire.

The case agreed upon by the City of London Commissioners of Sewers and the Great Central Gas Company, for the purpose of obtaining the opinion of the Court of Queen's Bench, whether the Metropolis Gas Act of 1860 overrides the company's special Act of 1851, is expected to come before the court at an early date. In the meantime, the Bill prepared by the company to remove the doubts raised by the City authorities, as to the legality of increasing the price of gas to 4s. 6d. per 1000 feet, has been rejected by the examiner of private Bills, on the ground that the standing orders had not been complied with, which require notice of the proposed introduction of a Bill to be advertised not later than November. The Standing Orders Committee may, nevertheless, allow the Bill to proceed, if reasons be adduced to justify a departure from the established rules; and, should the decision of the Court of Queen's Bench be adverse to the company, the complications that would consequently arise from the conflicting conditions of gas supply in the City, and in other parts of the metropolis, would afford sufficient ground for suspending the standing orders, in favour of a Bill that proposes to remove those difficulties.

The "turn of the year" has produced the usual slackness of this period in the meter trade, and the inspectors appointed in the metropolis, under the Sale of Gas Act, are now able to make head against the heavy arrears, which have, hitherto, oppressed them. The South London office was, indeed, completely cleared a few days since, and the inspector had no work to do. The ability of the metropolitan inspectors to meet the demands of the meter makers, may be attributed, in a great measure, to the efficient arrangements in the City office, and to the activity of the inspector with his assistants, who, it appears from the proceedings of the Court of Aldermen, reported in another column, has stamped no less than 26,825 meters. It is satisfactory, also, to know that the testing at the City inspector's office has given satisfaction to the public, who appear to have had such confidence in the manner in which the work is done that, it was stated by Alderman Wilson, many persons outside the City objected to have their meters stamped by any one excepting the City inspector; and, still further, that "in some cases where meters had been stamped by the Metropolitan Board inspectors, parties had objected to have them put up in their houses until they had been sent to the City inspector's office to get his stamp upon them." These facts were stated on the occasion of the presentation of a memorial from the gas-meter manufacturers of London to the Lord Mayor and the Court of Aldermen, praying them to resist the encroachment of the Metropolitan Board of Works with respect to the office of inspector of meters for the City of London, as the memorialists considered it to be of the greatest importance, not only to their interests, but to those of the public at large, that the office and appointment of inspector of meters in the City should be maintained independently of the Metropolitan Board of Works. Since the presentation of the memorial, the question of the validity of the appointment of the City meter inspector has been set at rest by the Attorney and the Solicitor-General, whose joint opinion on the subject was read at the Court of Aldermen, to the effect that the Act of last session does not transfer the powers conferred by the Sale of Gas Act on the justices of the county of the City of London to the Metropolitan Board. This opinion was given on a case drawn up by instructions from the Home Office, and it is directly opposed to the opinion given by the same Attorney-General last year on a case drawn by instructions from the Metropolitan Board. He was then assisted by Mr. Gray, who concurred with him, but who has now also gone over to the opposite opinion; their attention having been drawn to the distinction made in the Act between "*counties*" and "*counties of cities*," and London being a county of a city, the powers conferred on the City justices are not affected by the transfer of the powers "conferred on the justices of the peace of any county." This opinion of the Attorney and Solicitor-General fully confirms the assertion in our "Circular" on the 24th of September, that "the powers of the justices of the City of London under the Sale of Gas Act, which they exercise as *justices of a county of a city*, are not transferred to the Metropolitan Board by the Act of last session."

The members of the Metropolitan Board, who have been actively endeavouring to extend the jurisdiction of the Board, and to "stand up for their rights," were naturally enough astounded by the change of opinion founded on such nice legal distinctions, and were inclined to refer the question to the Court of Queen's Bench. Others, who took an economical view of the matter, proposed that the Attorney-General should be required to return the fee of ten guineas which he had received for misleading them—an act which common honesty, it may be assumed, will induce the right honourable gentleman to do, without being prompted thereto. No sum of money could, however, restore the good opinion which the Board have lost by their unseemly attempts to extend the authority granted them by Parliament. In their struggles for prerogative with the City justices, they have too clearly shown that the interests of the public are inferior, in their consideration, to the accession of power. We presume that the Board will now abandon their pretensions to jurisdiction in the City of London, and that the gas committee, to whom the matter has been referred, will content themselves with making such alterations in the districts of the inspectors as the contracted sphere of operations will require. They will, most probably, convert the central district into a northern district, with an office in the vicinity of King's Cross. There would then be five inspectors districts in the metropolis; and, if each of the inspectors be supplied with an efficient staff, the work may be satisfactorily done. There is, indeed, some danger that the threatened competition at Kingston may so far diminish the number of meters sent to be stamped, as to leave some of the inspectors appointed by the Board partly unemployed, and the legitimate income of the Board may be so much reduced, as to render their extravagant investment of £15,000 in offices and apparatus, unprofitable.

Another matter disturbed the equanimity of the members of the Metropolitan Board, at their last meeting. It may be remembered that, in the JOURNAL of the 19th of November last, we predicted that the officious interference of Mr. Cresy with

the duties of the inspectors was occasioned by "the desire to find a pretext for increasing the salary of the chairman's private secretary, on the ground of the increase in his labours which the carrying out of the Act entails upon him." This prediction has been verified to the letter. An application was made, on Friday last, by Mr. Cresy, for an increase of salary, on the plea that he had confided to him the arrangement of the numerous details necessary to enable the Board to put the Sale of Gas Act in operation. This application precipitated the storm which has been for a long time impending, and several members gave vent, in strong terms, to their estimates of the value of Mr. Cresy's services, and of inutility and illegality of his interference with the inspectors in the execution of their duties. Among the services Mr. Cresy has performed, may be reckoned his recommendation to the Board to vote £15,000 for buildings and apparatus, when one-third of that amount, judiciously expended, would have been sufficient for the purpose. We strongly advise Mr. Cresy to find some other ground for claiming an increase of salary than his labours in connexion with the Sale of Gas Act, which have been seriously detrimental to the reputation of the Board, and, we are prepared to prove, have wasted at least £10,000 of the ratepayers money.

The notice we took in our last number of the meter-stamping trade about to be set up by Mr. Taunton, at Kingston-upon-Thames, with the connivance of the magistrates of the borough, has called forth a reply, apparently on authority, in the *Surrey Comet*, published in that town. Not one of the facts we mentioned is contradicted, and the principal object of the article appears to be the vindication of the town council from the imputation that they had been unwittingly enticed by Mr. Taunton into making the arrangement. It is affirmed that the town council were fully aware that Mr. Taunton's object was to establish a meter-stamping business at Kingston, and that, so far from having been taken-in by him, they had, previous to his appointment, instituted a searching inquiry into the profit he expected to make by the undertaking. In reply to those inquiries, Mr. Taunton stated "that he had promises from manufacturers to send their meters to him to be stamped, *and he gave Mr. T. Glover a well-known meter manufacturer, as one of his referees.*" It appears from the *Surrey Comet* that the Kingston town council had it under consideration whether they should not themselves carry on the business of meter-stamping, for the benefit of the borough funds, but the question was decided in the negative; and, as a reason for this decision, it is *naïvely* remarked, "London manufacturers may send their meters to Mr. Taunton, but it does not follow they would send them to the Kingston corporation;" certainly not. This is a very satisfactory reply to the supposed imputation of deficient intellectual capacity in the Kingston town council; but the writer does not give so satisfactory an answer to the graver charge, that they have acted illegally by entering into such an arrangement. It is said that Mr. Taunton will not actually "appropriate" the fees. "He will pay them over to the borough treasurer at stated times, and will be remunerated by a salary equal in amount to the fees he receives for testing and stamping." This attempted evasion of the provisions of the Sale of Gas Act is not indeed defended by the writer, who says, in the next sentence, "It is quite true he will in reality receive the fees;" and, by so doing, we contend, he will contravene the 8th section of the Act, and that the town council will act illegally by conniving at it.

In the defence of the town council, the *Comet* has completely torn asunder the flimsy curtain behind which the meter-stamping business was to be conducted at Kingston; and has disclosed the wires that are to set the mechanism in motion. Mr. T. Glover was one of Mr. Taunton's referees, and there can be no doubt he is one of the London manufacturers who have promised to send their meters to Kingston to be stamped. The amount of fees paid by one large London manufacturer may amount to £600 or £700 a year, so that should Mr. Taunton not be favoured with orders of only one, the profits of the business would produce still him a good income. There can be no doubt that to make a trade of meter-stamping is a perversion of the Sale of Gas Act, which might lead to great abuses, and we are glad that it is presented in so flagrant a form as at Kingston, so that it may force itself into notice and be at once stopped. An effectual means of preventing it would be, as we have previously observed, by an amendment of the Act prohibiting the stamping of meters by any inspectors than those of the districts in which the meters are either made, or repaired, or intended to be used. The Metropolitan Board of Works ought, for their own protection, to be among the first to support such an amendment of the Act.

The following is a more perfect list than we published under this head on the 19th of November last, of the Exchequer stamps issued to meter inspectors appointed under the Sale of Gas Act, and of the names of the inspectors and includes all the stamps issued up to the 25th instant:—

No. of the Exchequer Stamp.	Name of Borough.	Name of Inspector.
1.	(This stamp is retained at the Exchequer.)	
2.	Sheffield	William Barlow.
3.	Aberdeen	Alexander Robb.
4.	Lancaster	Henry Harrison.
5.	Bristol	Benjamin Kitt.
6.	Ashton-under-Lyne	John Buchanan.
7.	Wakefield	E. Thresh.
8.	London (City)	Henry Sporne.
9.	Carlisle	Wm. Glendinning.
10.	Middlesborough	James Morris.
11.	Edinburgh	Robert Ferrier. William Gray. Benj. Johnston. Andrew Hoy. William Stobie. Alexander Reid. David Campbell. Zelcus Eshle. Alexander Kellet.
12.	Exeter	Henry Phillips.
13.	Liverpool	Daniel Horton.
14.	Louth	James Colam.
15.	Oldham	Joseph Toulson.
16.	Leeds	William Barratt.
17.	Staley Bridge	James Ford.
18.	Cork	John Ring.
19.	Bolton	William Lyons.
20.	Dublin	William Cotton.
21.		
22.	Portsmouth	Henry Moncrief.
23.	Birmingham	Thomas Jackson.
24.	Manchester	James Urquhart.
25.	Salford	Thomas C. Williams.
26.	Newport, Mon.	Conyers Kirby.
27.	Perth	Peter Hogg.
28.	Metropolitan Board	George Mills.
29.		Henry Airey.
30.		George Dethridge.
31.	Dundee	David Lanson.
32.	Lanark	James Wood, junr.
33.	Ayr	John Davidson.
34.	Lynn	Thomas Barton.
35.	Greenock	
36.	Rochester	William Aldridge.
37.	Bath	—. Williams.
38.	Gloucester County	W. E. Williams.
39.	Metropolitan Board	W. J. Ward.
40.	Preston	John Newton.
41.	Hull.	William Peasegood.
42.	Scarborough	Alexander Taylor.
43.	Wigan	
44.	Great Yarmouth	

We believe the number of gasholders stamped at the Exchequer now exceeds one hundred.

The Lord Chancellor has been engaged for five days in hearing the arguments of counsel upon an appeal from a judgment of Vice-Chancellor Wood, in the case of *Hills v. Evans*, in which the substantive questions at issue were—first, the validity of the patent obtained by Mr. Hills in November, 1849, for the purification of gas by the hydrated oxide of iron; and, secondly, whether that patent had been infringed by Mr. Evans in using oxidized iron-borings, or the rust of iron, for that purpose. The arguments present a *resumé* of all that has been urged on both sides of this subject during six years litigation; and as, by agreement between the parties, the Lord Chancellor's judgment is to be accepted as conclusive, and the right of appeal to the House of Lords has been abandoned, we have felt it incumbent on us to report the case in its final stage at considerable length. The proceedings of the first three days will be found elsewhere in our present issue, and the

remainder will be given in the next. At the conclusion of the argument on the fifth day, the Lord Chancellor expressed his opinion that Mr. Hills' patent was good, and valid at law; but he reserved his formal judgment till the question of the infringement by Mr. Evans had been argued, and he adjourned the further consideration of the matter for two days, to allow the defendants an opportunity of considering whether they would proceed further in the matter. Upon mature consideration, and looking at the short time that Mr. Hills' patent has to run, the defendants came to the conclusion, not to proceed further with the arguments as to the alleged infringement by Mr. Evans, and the Lord Chancellor's formal judgment is to be delivered to-morrow.

The Phœnix Gas Company, have obtained convictions against two of their consumers, at Greenwich, for the fraudulent use of their gas, under the circumstances stated in our report of the case in another column, and the Bristol papers, of Saturday last, contain a letter of apology from a gas-fitter, of that City, for having twice interfered with service-pipes, without the knowledge and consent of the company, and also with having, contrary to the provisions of "The Sale of Gas Act, 1859," removed and refixed a gas-meter, belonging to the Bristol Gas Company, without previous notice to the gas company, as is required to be given to them under their Act. The latter goes on to say that:—

By the commission of these separate offences, I have jeopardized the interest of the company and security of the premises whereon the said acts were committed, and have further rendered myself liable to the imposition of three separate penalties of five pounds each, recoverable by information before the magistrates of Bristol. Now, the directors of the Bristol United Gaslight Company having consented, upon my assurance that these offences were committed in ignorance of the law, and in consideration of my making this explanation and apology, not to proceed against me for the recovery of the aforesaid penalties, I hereby tender to the directors of the gas company my acknowledgment for their kind forbearance, and hereby publicly assure them that I will not again be guilty of the aforesaid offences, or any other infringement of their Act of Incorporation, and I hereby undertake to publish this letter, at my own expense, once in each of the Saturday Bristol weekly newspapers, and to hand the sum of twenty shillings to each of the charitable institutions—the Bristol Royal Infirmary and the General Hospital.

A case was decided in the Court of Queen's Bench on the 24th inst., by which it appears that neither the Public Health Act, 1848, nor the Local Government Act, 1858, gives power to a local board to attach lamp-irons or gas-pipes to any house without the consent of the owner.

Correspondence.

NAPHTHALINE IN GAS-MAINS.

Sir,—Mr. Anderson has told us, in a letter inserted in the Journal sometime since, the method adopted by him for clearing gas-mains, in gas-works and streets, of naphthaline.

I should, for one, feel obliged to him if he could tell us how it is formed, and give us some method for preventing its deposit; by so doing, he would, I am sure, be conferring a great boon on his brethren in the gas world, and add another testimony to the truth of the old adage that "Prevention is better than a cure."

A Manager.

Register of New Patents.

1645.—Henry Hamer, of Hosforth, York, paper manufacturer, for "*Improvements in chimney-tops and ventilators.*" Patent dated June 27, 1861.

This invention has for its objects the prevention and cure of smoky chimneys, and the ventilation of rooms. The improvements consist in arranging and constructing apparatus with flanges and openings or apertures in such a manner that downward currents of wind will be reversed and diverted when coming in contact therewith, and caused to ascend instead of descending the chimney or ventilating-shaft, thus tending to increase the draft. The lower part of the outer case of the ventilating apparatus has a flange projecting beyond the surface of the upper part of the outer case, above which flange are a series of openings, divided from each other by brackets or dividing ribs, and forming channels betwixt the outer and the inner casing. Openings are also formed in the top part by flanges or rings, and dividing-ribs. Downward currents of wind will strike against the flange in the lower part of the outer casing, and pass through the openings formed in the top part, which will direct and conduct them upwards driving the smoke out, either at the top or through the openings betwixt the rings, thus tending to increase the draft. By placing a cover over the top to prevent rain from descending, it will answer as a ventilator, as the wind, foul air, or smoke, can escape through the openings, and also under the edge of the cover.

1666.—William Clark, of 53, Chancery Lane, Middlesex, engineer and patent agent, for "*Improvements in the distillation of solid and liquid combustible matters.*" A communication from Etienne Charles Zacharie Bouchard, C.E., of Paris. Patent dated June 29, 1861.

This invention relates to a new mode of distilling combustible materials, so as to obtain lighting or heating gas, or it may be charcoal. This new method consists in injecting in the middle of the combustible materials hot incombustible gases, so that the heating and destructive distillation may be, so to speak, interior and molecular, and have an effect on the gaseous or liquid products which are evolved. This method of distillation is employed for all combustible materials, either solid or liquid, or a mixture of the two. Under the name of incombustible gas is implied azote, carbonic acid, hydrogen, and other gases employed either separately or together, and previously heated. The fumes resulting from complete carbonization can be specially employed—for example, this new method of distillation may be applied to peat placed in furnaces, similar to those used in the manufacture of gas. In order to obtain greater results, and more perfect distillation, the volatile products are reheated in a retort, in which all the carbonate of hydrogen liquids or tar are converted into gas.

In order to obtain gases combustible in the gasometer, instead of injecting, as heating gas, azote and carbonic acid, hydrogen produced by any known means, as, for instance, by the simple and pure distillation of peat, may be employed. This incombustible heated hydrogen combines with the carburets of hydrogen of the combustible materials in process of distillation, and forms carbonated hydrogen which will pass to the gasometer in such a state that there will be no separation necessary.

1669.—William Livesey, of 3, Park Cottages, Park Village East, Middlesex, for "*Improvements in wet gas-meters.*" Patent dated June 29, 1861.

This invention has for its object—to connect the meter direct to the iron service-pipes without the use of lead, or other flexible pipes, or soldered joints; to regulate the opening and closing of the inlet and outlet-pipes simultaneously; to ascertain the level of the water inside the meter without putting the meter out of action; to prevent the oscillation of the lights from any sudden increase or irregularity in the pressure; to prevent any injurious effect upon the registration from the meter being tilted or placed out of its level, and to simplify the index.

To connect the meter direct to the iron service-pipes, without the use of lead, or other flexible pipes, the inlet and outlet-tubes are both fixed at the back of the meter in a line with each other. To the top of each tube is attached a cock, of which both the plugs and the openings are horizontal, and to these the service-pipes are connected directly by a socket screwed on to the cocks, thus forming a rigid joint and preventing the tilting of the meter or other interference with it when it is once fixed.

To regulate the opening and closing of the inlet and outlet-pipes simultaneously, the cocks are arranged in a line, so that one and the same handle fits upon and actuates the plugs of both cocks at the same time. The handle is so arranged, that it can also actuate only one cock at a time, and it is fixed in position for opening or closing both cocks at once by means of a pin, which can be removed at pleasure. By the above arrangement, when the gas is turned off, the meter is isolated with gas inside, which prevents the injurious action of the atmosphere on the metal of the interior, as also the decrease of the water-level by evaporation.

To ascertain whether the water inside the meter is at the proper level without putting the meter out of action, there is fixed at some convenient part of the meter a short tube, communicating with the interior of the meter, and closed at the end. This tube is provided with two small openings closed with plugs, and is placed at such a level that the one small opening is a little above, and the other a little below the proper water-level, so that on removing one plug or the other it can be ascertained, according as water or gas passes out of the opening, whether the water is at the proper level.

To prevent any injurious effect upon the registration from the meter being tilted or placed out of its level, and to prevent the oscillation or putting out of the lights from any sudden increase or irregularity in the pressure, there is attached to the float a double valve, the lower part of which closes the opening through which the gas passes from the inlet-pipe into the chamber when the proper level is too low, or when the meter is tilted forward, while the upper part closes the opening when the water-level is too high, or when the meter is tilted backwards. By this arrangement, the registration is secured within the limits allowed by the Sale of Gas Act. By this arrangement, the pressure of the gas has a tendency to raise the float instead of depressing it as at present; and the supply may also be augmented, and the pressure increased to any extent, without putting out the lights. The patentee does not restrict himself to the exact form of double valve shown in the drawing, as the same may be variously modified without departing from the principle of this part of the invention. In some cases, and particularly where the wheel or drum of the meter is so arranged as to admit of a greater margin of float than those in general used, instead of employing the just described double valve arrangement, the ordinary single valve is used, and the outlet is constructed so as to come down very near to the proper water-level, while the inlet-tube is covered by another tube which is suspended from the top of the box, and which also passes down very near to the proper water-level. By these arrangements, if the water is too high in the meter, the inlet and outlet-tubes will dip into the water and shut off the supply of gas. The water under the outlet-pipe being shut off from the other parts of the meter, prevents the water from being drawn off, and the gas being passed through the meter without registering, in case of the water-level being first lowered and the meter then tilted to give an undue lift to the float. In no case, however, is the double-valve arrangement and the one just described employed together in the same meter.

To simplify the index, the same is constructed with the usual number of multiplying wheels and pinions, but hands and dials are only attached to those spindles which turn from left to right, by which arrangement one dial is obtained registering units of cubic feet, one registering hundreds, and one large one registering 100,000 cubic feet, the hands of which three dials all turn in the same direction, by which the reading of the same is much simplified. As it frequently occurs in repairing the indices of meters that through carelessness new wheels are put in which have not got the same number of teeth as the other wheels, and by this means the index does not register correctly, it is proposed to construct the index-box so as to project from the meter, and to make the sides of the same of glass, so that the several

wheels and pinions may be examined to ascertain whether they have the proper number of teeth.

1670.—William Dingwall, of Dundee, Forfar, N.B., joiner, for "*Improvements in fluid meters.*" Patent dated July 1, 1861.

This invention relates to improvements in the construction of meters for measuring water and all other fluids. In one modification, the details are contained in a chamber which is of a shape resembling that obtained by placing two truncated cones with their bases together, and which is formed by two castings united by flanges at the middle. The measuring is effected by means of a compressed diaphragm working to and fro in the chamber, and dividing it into upper and lower compartments. The diaphragm consists of a central metal portion, and is attached to an annular portion of flexible material, such as leather or vulcanized rubber, the outer edge of this last being fixed in the joint running round the chamber formed by the flanges. The valves which regulate the passage of the fluid alternately to and from the oppsite sides of the diaphragm, are arranged in the central metal part thereof. This part consists of upper and lower discs, contrived so as, on being fixed together by screws, to catch and hold the inner edge of the flexible part; and the space between the discs is divided into two separate compartments—the inlet compartment and the outlet compartment—by flanges across the middle. These compartments communicate respectively with the inlet and outlet apertures through the sides of the meter by means of flexible tubes, arranged in coils to permit of their accommodating themselves to the movements of the diaphragm. Each of the compartments has two openings, one through the top and the other through the bottom of the diaphragm, directly opposite to each other. Each pair of openings is controlled by a single disc-valve lying between them, the moving up and down of which closes the top or bottom opening in each case. The distance between the opposite ports or apertures is exceedingly short, being equal to the thickness of the valve, and the slight space necessary for the passage of the fluid though one of the openings. In consequence of this arrangement, not only is the effective discharge or passage area the same (one aperture being opened precisely as the opposite one is being closed), but also there is no appreciable column of fluid between the ports, the motion of which is to be reversed. The valves are fixed upon spindles, jointed to opposite ends of a beam or lever centred midway between them on a pair of small brackets on the top of the diaphragm, in such a way that the two valves are always in opposite positions, except at the instant of reversal. To one end of the beam, there is jointed a peculiarly-shaped lever formed with two side-plates; and, to the other end of the beam, there is jointed a link, also double-sided, which is connected to the lever by a pair of slotted links. A pin on the lever works in the slot of each link, whilst a steel spring is on each side applied to the lever-pin, and to a pin on the inner end of each slotted link, in such a way as to produce a tension between the lever-pins and the outer ends of the slotted links, where they are jointed to the beam-link. The action of this arrangement is to keep the valves firmly against their sides, except at the instant they have to alter their positions. The change of the valves is effected by a movement of the peculiarly-shaped lever, brought about as the diaphragm reaches either end of its stroke by the tightening of a check-strap attached to the lever, and to the top and side of the chamber. Both ends of this check-strap are brought through between the flanges, and, by adjusting their lengths, the stroke of the lever can be made to accurately measure a determined quantity. The motion of the peculiarly-shaped lever is limited in its upward direction by a stop, and in its downward direction by coming in contact with the disc. Counting mechanism of the ordinary kind is applied to register the number of double strokes made by the diaphragm, and the first ratchet-wheel of this mechanism is acted upon by a catch carried by a lever, acted upon by the diaphragm each time it makes its upward stroke. A safety-valve is in some cases applied to the outlet-chamber of the diaphragm, to provide against injury from back-pressure. This valve is double, and consists of two washers applied to the outsides of apertures on opposite sides of the diaphragm, being fixed on a single spindle passing across. The washers are of elastic or flexible material, and they can be screwed up more or less tightly. When the back-pressure is not sufficiently great to lift the washers, the fluid can pass directly through the diaphragm, and so be incapable of doing injury.

The claim is for the constructing, arranging, and applying of the valvular details, of reciprocating fluid-meters, substantially as hereinbefore described.

1692.—Richard Jolley, of 47, St. John Street, Smithfield, London, for "*An improved apparatus for heating, cooling, or drying, infusing, extracting, or absorbing vapours and gas for manufacturing, medical, or domestic purposes, and for preserving liquids and solids, alimentary or otherwise.*" Provisional protection only obtained. Dated July 3, 1861.

This apparatus or enclosure may be constructed of any shape or size, moveable for transit or fixed, and upon any non-conducting principle, wholly or in part of pulp or fibrous substance, woven and compressed, animal or vegetable matter, or made to cohere with any liquid or waterproof matter—resinous, vitreous, or otherwise—the same being fixed specially round all angles and joints, to exclude air, water, heat, or cold. Within the top or any part of this enclosure is fitted a vessel or vessels, metallic or otherwise, corrugated, ribbed, angulated, or not, with grooved, helical, circular, angular, or flat sides, ends, or bottoms, or all of such a form as will cause the adhesion of vapours during the process of extraction. These vessels are provided with pipes, traps, and drains, for quickly carrying off what is extracted, and may be used with a continuous flow or force of hot or cold water or air through pipes or not, or to be charged, especially on the upper part, with any liquids or solids, mixed or otherwise, naturally or artificially producing heat or cold according to temperature required; and these vessels may be double or one within another, and the space between may be exhausted or filled with any kind of liquid or solid, in like manner as the aforesaid vessels, or warmed by gas or any other means. Within the enclosure is placed, in moveable cases or otherwise, any absorbing liquid or solid which has an affinity for the particular gas or vapour which is required to be absorbed or extracted, and, to prevent the counter attraction of metals used in the construction, they are covered by some fibrous material. Also, the enclosure may be used by exhausting therefrom the air, by heat, steam, or pumping.

1700.—James Morris Gale, civil engineer, of Glasgow, Lanark, and Thomas Kennedy, water-meter manufacturer, of Kilmarnock, Ayr, for "*Improvements in taps or valves.*" Patent dated July 4, 1861.

This invention relates to the production of taps or valves suitable for street-wells, and for any situation where it is desirable to have a tap which is self-closing, and is durable, and not easily put out of order. In one modification, the body of the tap consists of a cylindrical barrel, one part of which is of less diameter than the other. The inlet from the service-pipe is from a branch entering laterally the smaller part, whilst the outlet-branch communicates laterally with the larger part of the barrel. At the enlargement of the barrel, there is an internal step, forming a slightly projecting seat for the valve, which when closed prevents the passage of the water through from the inlet to the outlet. The valve is a washer of leather, gutta-percha, vulcanized rubber, or similar material, fixed on a spindle, or the valve and its seat may both be of metal, and either conical or flat; and, when of metal, the valve may be contrived so as to be capable of adjusting itself to its seat. One side of the spindle projects through the small part of the barrel, and has a cup-leather fixed upon it, which serves as a packing for that end of the barrel, whilst the internal pressure upon it balances the pressure upon the valve-washer. The other end of the spindle enters a second spindle made tubular to receive it, which second spindle can turn upon it, whilst moving it longitudinally, being connected by a pin and groove. The outer spindle is screwed externally, with, by preference, a quick pitched screw of say four threads, and works in a correspondingly screwed part of the barrel. A washer on the inner spindle acts as a packing between the screw and the parts through which the water passes. The valve-washer is fixed on the spindle between a shoulder thereon, and a tubular piece passed on between two washers, a nut screwed upon the spindle outside securing the whole. The second or outer spindle projects externally beyond the screwed part, where the barrel terminates, and has fixed upon it a weighted-lever, or a quadrant, or a pulley, with a cord or chain and weight attached, whilst the extreme end of the spindle is shaped to receive the handle or key by means of which the tap is opened. The opening is effected by means of the handle turning the outer-spindle, which, from the action of the screw, draws the valve-washer from its seat, whilst, on the handle being released, the weight by the reverse action closes the valve. The discharge-pipe is by preference formed with a coil or convolution, which has the effect of throwing the water off in a solid stream, and a small branch-tube uniting the two lower parts of the coil is added, to insure the emptying thereof on closing the tube, and thereby prevent injury from frost. An important feature of this improved tap, is the constructing and putting together of the parts in such a way that the moving parts can be easily removed, and the whole be examined, cleaned, or repaired, without unfixing the tap, body, or any of the pipe-connexions.

1707.—Benjamin Fowler the younger, of Liverpool, Lancaster, iron-founder, for "*An improved sewer or sink-trap.*" Provisional protection only obtained. Dated July 5, 1861.

A sewer-trap, constructed according to this invention, consists of a square or other suitably-shaped box formed of iron, clay, or other suitable material, having the sides thereof flanging outwards from the bottom upwards, and having on the upper edge a ledge surrounded by a lip upon three sides of which the lid rests when closed. The back ledge is formed a little lower than the front and side ones, and the back of the sides of the box is hollowed out to receive the lugs on the under-side of the lid, by which it is jointed to the sides of the box with a horizontal tranverse pin or pins. The bottom of the box is formed with an oblong-hollow truncated pyramid, which rises some distance inside of the box, and is opened at the top. The grate-cover or lid is cast with an oblong-box in the centre, which, being opened on the underside, surrounds the top of the truncated pyramid and escape-port when closed, but is not in contact therewith. The inverted-box is sufficiently large to allow the water to pass up into, or on the underside of the lid, and escape through the opening on the top of the truncated pyramid into the sewer, the sediment remaining in the body of the box from which it can be readily removed.

In applying this invention to a sink-trap, it is preferred, in most cases, to form the external-box round in place of square, and in some cases to surround the outlet-opening by a truncated conical flange in place of a pyramid, and to form the box on the underside of the lid of a shape to coincide therewith.

The traps, hereinbefore described, admit of their being cast with great facility as they are in two pieces only, and the parts are of such a shape as to allow them to be readily drawn from the sand when cast in metal.

1711.—Jules Emile Melon de Pradon and Louis Gustave Lecoq, of 2, Rue Ste. Appoline, Paris, France, and of 4, South Street, Finsbury, London, for "*Improvements in apparatus for lighting.*" Patent dated July 5, 1861.

The object of these improvements is to regulate the lighting apparatus employed until now for the stage and house of theatres, also for lighting large buildings and other large places. The essentially new principle of this improved apparatus is based on the application of the luminous rays sent back by direct and indirect interior reflection, into capacities of the shape of pipes, allowing it to conduct to the interior the odours and deleterious gases resulting from the employment of gas, and its combustion in buildings and places in which it is essential that the deleterious gases of combustion should be expelled into the open air. The invention consists in the employment of a pipe or conduit on which the gas-burners are mounted, the whole being enclosed in a reflector, the interior of which will reflect the luminous rays and throw them on polished or unpolished glass. Screens of various colours are placed at will in such a manner that the light can be obtained in the tone required. The advantages obtained from the application of the improvements are—first, that there is no fear of fire to the actors or *artistes*; secondly, the suppression of the hot current in front of the stage, and before and round the said apparatus; third, the rejection to the exterior of the house of all the products of combustion; fourth, the employment of screens invisible to the public for varying the colour of the light; and, fifth, the facility of varying the maximum light from one point to another.

1717.—Robert Angus Smith, 20, Devonshire Street, Manchester, for "*Improvements in purifying gas.*" Patent dated July 6, 1861.

This invention of an improved method in purifying gas is principally intended for the removal of the bisulphide of carbon, and consists in so disposing of a solution of lead and certain other metals in caustic alkali as to present a sufficiently large surface. The metallic sulphide formed is oxidized by exposure to the air.

The gas, which it is preferred should be previously purified by some ordinary means from its sulphuretted hydrogen and carbonic acid, is passed through sawdust or other convenient absorbent material presenting a large surface, moistened with a solution of oxide of lead or litharge in caustic soda, and arranged in thick layers in dry purifiers, after the manner of oxide of iron. It is found that about 4lbs. of oxide of lead, dissolved in one gallon of caustic soda, having a specific gravity of 1·250, will answer the purpose in ordinary cases, but the more lead the better. It is preferred to have two purifiers and to use them alternately, each being of the usual depth, and of such an area at least that the gas shall not pass through in larger quantities than one cubic foot for each superficial inch during the hour. This is about the proportion of area generally in use in well established works for oxide of iron, but the greater it is the better. The gas so purified has been found entirely free from sulphur as well as the sulphuretted hydrogen, if not previously removed, or of any residue of it that may have escaped the previous ordinary process.

During the purification of gas from sulphur by means of this invention, the sulphur combines with the lead to form sulphide of lead. When the material is spent, the lead is recovered for further use by exposing the mixture for a few hours to the air, either in the purifier or out of it. The black sulphide thereupon changes into the white sulphate of lead, to which, as it contains oxide of lead, is then added a fresh dose of alkaline ley to bring it again into solution, and make it fit to repeat its former service. After several alternations of its use and restoration, the sawdust becomes inconveniently full of sulphate of soda. When this is the case, that salt is washed out with water, and as little or no lead is thereby removed, the metal and sawdust are again thus made available for use.

Instead of oxide of lead, a saturated solution of lead may be substituted in the first instance, and sometimes it is to be obtained as a cheap residue of other manufacturing operations.

Instead of a compound of lead, oxide of zinc, antimony, arsenic, or tin, may be dissolved in the alkali, but the solution of lead is preferred; and, instead of soda, caustic potash may be substituted, but it is more costly. It is found, also, that in place of either of the above chemicals, the sawdust may be usefully moistened with a solution of copper in ammonia, or of iron, in either organic acids or other organic substances, in which it is soluble, such as sugar, treacle, &c.; all such solutions being better the stronger they are, but, in the estimation of the patentee, nothing is altogether so desirable as the solution of oxide of lead in caustic soda.

Lastly, instead of using the several chemical re-agents in dry purifiers, as above recommended, the solution, without the sawdust, may be brought into contact with the gas by what is ordinarily understood as "scrubbing," but, that modification is not recommended on account of the precipitates; which might be found inconvenient, and for other reasons of a mechanical character that will be understood.

It is not proposed to confine the use of this invention to public manufactories of gas, as every gas consumer who shall have the misfortune to be in a district supplied with sulphurous gas, may, by means of a small box furnished under this patent, purify the gas for himself, without his being put to the least trouble, or personal inconvenience.

The claim is for the purifying of gas from sulphur and its compounds, except sulphuretted hydrogen, by treating it with alkaline solutions of the metals, and in the manner hereinbefore particularly described.

1726.—Alfred Noble, of Bristol, analytical chemist, for "*Improvements in obtaining products from alkali waste and gas-lime refuse.*" Patent dated July 6, 1861.

This invention has for its object improvements in obtaining products from alkali waste and gas-lime refuse. For this purpose, alkali waste is allowed to stand in a heap or in vats for a few days, after which water is poured upon it, and it is permitted to remain on it for a short time. The liquor is then run off. This liquor, or the liquor which drains from alkali waste heaps, is mixed or brought in contact with sulphurous acid, either in a gaseous state or in solution. By these means, sulphur is precipitated in a marketable form; the clear supernatant liquor also contains hydrosulphide of lime. This solution of hydrosulphide of lime may either be boiled down to obtain sulphate of lime, or it may be decomposed with carbonate of soda to obtain hydrosulphide of soda; or it may be decomposed wtih hydrochloric acid to obtain sulphur and sulphurous acid.

In like manner, the refuse from lime-purifiers of gas-works is treated to obtain like products.

The mode in which it is preferred to conduct the operation is as follows:—In treating alkali waste, it is placed in a heap or in an iron vat, the latter being preferable, as it retains any liquor which runs from the material. The waste is laid lightly in the vat or heap, so that the air may be able to penetrate it freely; and in this way it is left for about three days, during which time it is, as often as it may require, sprinkled with a small quantity of water to keep it just moist. At the end of three days, the heap is turned over, and is then again left for about two days more, being as before kept moist by sprinkling it with water, should it prove necessary. The time of exposure to produce the best results, varies, according to the weather and the quality of the waste, and is judged of from the appearance of the material as to when the exposure has been sufficient. The waste at the commencement of the process is black, or nearly so; during the exposure, it becomes of a darkish green mixed with spots of small particles of yellow colour. When the greenish colour is fully developed, the duration of the exposure has been sufficient. If the exposure is continued longer, a loss of product will be the result. Water is then run on the waste to dissolve out all that is soluble. From ten to fifteen gallons of water to one hundredweight of waste is usually employed. Sometimes, the waste is stirred up with the water, and the liquid then drawn off and treated with sulphurous acid. For this purpose, a tower of brick-work of convenient size is employed, say 20 feet high and 3 or 4 feet in diameter. This tower is filled with siliceous stones, about the size of a man's fist. The liquid is pumped to the top of the tower and allowed to trickle down over the stones, and escape at the bottom of the tower. The sulphurous acid gas obtained by burning pyrites, or in any convenient manner, is introduced by a flue into the bottom of the tower, and rises up through it. The quantity of gas employed should not be greater than the liquid descending the tower can readily absorb, otherwise a loss of gas will result. The liquid, after passing through the tower, should smell distinctly of sulphurous acid. If the acid is considerably in excess, some liquor, which has not been so treated, is added to the liquor which has descended the tower, and this is continued until the excess of acid is absorbed, or nearly so. The liquor is now left to stand until the sulphur which it contains in suspension is deposited. The sulphur thus obtained is drained and dried; it is then suitable for use, for the manufacture of sulphuric acid, or for other purposes for which commercial sulphur is now made. The clear liquid may be evaporated to obtain hyposulphide of lime for commerce; or carbonate of soda may be added to it, until it no longer produces a precipitate, and when the precipitate, which is carbonate of lime, has separated, the clear liquor may be evaporated to obtain hyposulphite of soda; or hydrochloric acid may be added to the clear liquid from the tower, until one half the sulphur of the hyposulphite of lime is precipitated, the other half remaining in solution as free sulphurous acid. This free sulphurous acid is utilized by adding to the liquid already holding sulphur in suspension, some of the ordinary waste liquor, until the free acid is absorbed. The resulting mixture is treated in the same manner as the liquid from the tower, so far as concerns the draining and drying the sulphur, the supernatant liquid which contains chloride of calcium not being of any practical value.

When treating the refuse from lime-purifiers of gas-works, in place of alkali waste, the process is as above described, except that the exposure of the material in heaps or vats to the air may be dispensed with advantageously, and the material be at once treated with water, or it is possible to proceed exactly as with alkali waste.

The claim is for the treatment of alkali waste, and the refuse from the lime-purifiers of gas-works with sulphurous acid as described.

APPLICATIONS FOR LETTERS PATENT.

113.—William Cleland, of 39, St. George's Hill, Everton, Liverpool, for "*Improvements in treating and utilizing certain materials used, and products obtained in the manufacture of gas, and in apparatus connected with the said treatment.*" Jan. 15, 1862.

136.—William Tice, of 16, Downham Road, Islington, London, for "*Improvements in gas-regulators, and other apparatus in which moveable spindles are employed.*" Jan. 18, 1862.

163.—Louis Martin, Chemist, No. 13, Rue Gaillon, Paris, for "*Improvements in the treatment of mineral oils, and in the apparatus connected therewith.*" Jan. 22, 1862.

164.—Isaac Roberts, of Liverpool, contractor, for "*Improvements in combined hydraulic motive-power engines and meters.*" Jan. 22, 1862.

176.—George Rogers, of Staines, Middlesex, plumber, for "*Improved mechanical arrangements for letting off water, or other liquids, from butts, vessels, or cisterns.*" Jan. 23, 1862.

GRANTS OF PROVISIONAL PROTECTION.

2473.—William Malam, of Skinner Street, London, gas engineer, for "*Improvements in apparatus for the manufacture of gas.*" Oct. 3, 1861.

2763.—Thomas Spencer, of Prescot, Lancaster, earthenware manufacturer, and Thomas Robinson, of St. Helen's, in the said co., engineer, for "*Improvements in machinery or apparatus for making pipes, and other articles of earthenware, and in the form of pipes for gas, sewage, and other purposes.*" A communication. Nov. 2, 1861.

2986.—Hermann Brambach, of 11, Lungengasse, Cologne, merchant, for "*A new mode of manufacturing gas for illuminating purposes.*" Nov. 27, 1861.

3184.—Joseph Henry George Wells, of 2, Sandhurst Villas, Binfield Road, Stockwell, Surrey, civil engineer, for "*Improvements in the method of, and apparatus for, pumping elastic fluids.*" Dec. 19, 1861.

3208.—William Mattieu Williams, of Handsworth, in the co. of Stafford, teacher, for "*An improvement, or improvements in treating coal and other bituminous minerals and peat, in order to obtain solid and liquid hydrocarbons therefrom, and in apparatus to be used for that purpose.*" Dec. 21, 1861.

3243.—Thomas William Atlee, druggist's factor, of Birmingham, for "*Certain improvements in cocks or taps for drawing off fluids.*" Dec. 27, 1861.

3264.—Neill M'Haffie, of 16, Summer Street, Mile End, Glasgow, for "*Improvements in ventilators or valves for regulating the passage of air or other fluids, whether of a gaseous or liquid form.*" Dec. 31, 1861.

3270.—William Edward Newton, 66, Chancery Lane, London, civil engineer, for "*Improved apparatus for obtaining motive power from explosive compounds.*" Dec. 31, 1861.

6.—Thomas Charles Clarke, of Liverpool, civil engineer, for "*Improvements in the construction of apparatus for heating and circulating water and other liquids.*" Jan. 1, 1862.

14.—Edmund Francis Davis, of Tavistock House, Tavistock Square, London, for "*Improvements in gas-burners.*" Jan. 1, 1862.

29.—James Whitton Arundell, of 265, Gresham House, Old Broad Street, London, gentleman, for "*An improved method, and improved apparatus, for removing impurities from coal, parts of which invention are applicable for the separation and cleansing of ore, and other minerals.*" Jan. 4, 1862.

32.—Richard Henry Cotter, of Cambridge Heath, London, for "*An improved apparatus for instantaneously lighting certain lamps, and, when desired, extinguishing the same.*" Jan. 4, 1862.

37.—ARTHUR WARNER, of 31, Threadneedle Street, in the City of London, merchant, for "*Improvements in preparing materials for and in purifying coal-gas.*" Jan. 4, 1862.

NOTICES TO PROCEED.

2229.—CHARLES FELTON KIRKMAN, of Palace New Road, Lambeth, for "*Improvements in obtaining manure from sewage, and in the apparatus employed therein.*" Sept. 6, 1861.

2316.—FREDERICK BARNETT, inventor, of 60, St. Mary Axe, London, for "*An improvement in the light given by street, and other lamps, by means of reflectors in white earthenware, china, and all enamel materials, in conjunction with an improved chimney to draw up the exhalations and smoke of all lighting materials.*" Sept. 17, 1861.

2323.—GEORGE WHITE, of 7A, Pancras Lane, in the City of London, for "*Improvements in apparatus for filtering or purifying water, or other liquids.*" A communication. Sept. 18, 1861.

2344.—JOHN GRAHAM, of 2, Anne Street, Devonport Street, Commercial Road East, London, pattern maker, for "*An improved double-acting force or lift-pump for ships, fire-engines, and other purposes.*" Sept. 20, 1861.

2377.—JOSEPH JACOB, of Brünn, Austria, but at present residing in Golden Square, W., London, for "*Improvements in the mode of, and apparatus for, obtaining and treating hydrogen gas, and the application thereof to various purposes, parts of which improvements are applicable to the manufacture of iron and steel.*" A communication. Sept. 23, 1861.

2412.—WILLIAM CLARK, of 53, Chancery Lane, London, engineer and patent agent, for "*Improvements in the manufacture of peat.*" A communication. Sept. 26, 1861.

3148.—WILLIAM HUSBAND, of Hayle, Cornwall, for "*An improved water safety-valve.*" Dec. 14, 1861.

3208.—WILLIAM MATTIEU WILLIAMS, of Handsworth, Stafford, teacher, for "*An improvement, or improvements in treating coal and other bituminous materials and peat, in order to obtain solid and liquid hydrocarbons therefrom, and in apparatus to be used for that purpose.*" Dec. 21, 1861.

3256.—GEORGE HENRY BIRKBECK, of the firm of Tongue and Birkbeck, of 34, Southampton Buildings, Chancery Lane, London, patent agents and engineers, for "*Improvements in apparatus for raising or forcing water, or other fluids.*" A communication. Dec. 30, 1861.

Legal Intelligence.

COURT OF CHANCERY.

THURSDAY, JAN. 16.

(*Before the* LORD CHANCELLOR.)

HILLS *v.* EVANS.

This case came before the court to-day according to an arrangement made on a previous day, for rehearing on the points of law reserved by the Court of Exchequer Chamber, on the question of the infringement of the patent of the plaintiff by the defendant, and which has been already the subject of very protracted legal proceedings, commencing so far back as the year 1856, which have been from time to time fully reported in this JOURNAL. By permission of Vice-Chancellor Wood, who granted an injunction against the defendant, leave was given to him to bring before the Lord Chancellor, in the present hearing, all the questions and points of law as the defendant in the case of *Hills v. the London Gas Company* might have brought before the Court of Error, if such appeal had been prosecuted.

Mr. ROLT, Mr. GROVE, Mr. MARTEN and Mr. HINDMARCH appeared for the plaintiff; Sir H. CAIRNS, Mr. BOVILL, the Hon. G. DENMAN, and Mr. DRUCE were counsel for the defendant.

Mr. BOVILL said, he had the honour to appear before his lordship to argue a case which was pending in the Court of Exchequer, and was one that was called *Hills v. the London Gas Light Company*. He had not had the advantage of being engaged there, but was counsel on a former occasion, and he had endeavoured to make himself acquainted with all the points on which the case was entered on an appeal, in the Exchequer Chamber, from the Court of Exchequer.

The LORD CHANCELLOR said, he was to understand that the case would come before him on those points of law which were involved if the appeal had been prosecuted, as had been proposed before the Exchequer Chamber.

Mr. BOVILL said, his lordship had most correctly expressed it, and would, therefore, perfectly understand the position in which he was placed.

The LORD CHANCELLOR said, he presumed the patent in this case came into the same category as Croll's and Laming's patent.

Mr. BOVILL said that was so, and it was stated in the Court of Exchequer that at the trial certain points of law were reserved. At the close of the case, certain documents and evidence were offered, and which were then before the court; and, at the conclusion of the case, the Lord Chief Baron, instead of expressing an opinion, reserved the question of facts, which were properly triable by a jury, should be left for further consideration. The points of law being reserved, the case proceeded the same as if no points of law had been raised, and the jury indeed tried the question of law as well as of facts. For instance, on points of the specification, his lordship left those points to the jury. With reference to the facts, they were proved beyond all dispute, and on those facts, the defendants were entitled to have had the verdict entered in their favour; and, although the question of facts depended on the law as to the specification, yet his lordship would have that point reserved. As to whether the invention was new, or whether the plaintiff was the inventor, was brought on in a trial which lasted for five days, and the report of it was contained in the bulky volume which he held in his hand, and which presented, on perusal, if not the clearest, the fullest information upon the subject matter of this patent. As the discussion proceeded, their lordships suggested an arrangement, which contained, not the points reserved at the trial, but one that should define the two specifications of Croll and Hills, and enable the court to say whether one was a copy of the other. Then, there was the same as regarded Laming's patent, and taking the two specifications by themselves, without offering evidence of facts to enable the court to understand what the words in the specifications meant—after two or three days the court said they were not in a position, without parole evidence, to say whether or not one was like the other. Evidence was wanting, and the court was obliged to say that they could do nothing on being confined to the specification. Many more days were occupied, and the result was that the various points of law were argued, or rather treated, and the subsequent discussion was more on matters of fact, and whether there should be a new trial, without any very clear understanding as to what was reserved. Mr. Croll's patent was reserved—and as to what was done before he took out the patent and afterwards. The facts as regarded Mr. Croll's patent were proved and undisputable, and must remain as matters of fact; and, if their lordships came to look through their judgment, they would find that those matters had been scarcely treated as matters of fact, and as they were entitled to be treated on the part of the defendant. It was sufficient to say that those points became the subject of appeal for the opinion of the court above, whenever any court might decide their right of appeal. If the court should refuse the rule, or on granting it did not make it absolute, neither party would be entitled to appeal without the consent of the court that pronounced the judgment. He (Mr. Bovill) had made points at the trial which were reserved at first, and he gave notice of them formally at the end of the case, so that they might be embodied in the rule to be moved in the Court of Exchequer, if it were open to appeal. He would now take the question substantially, whether the invention of Mr. Hills was new, either in its parts, or as a whole.

The LORD CHANCELLOR said, it would be inconvenient to go into the merits of the case.

Mr. BOVILL said, he would not, only as far as they applied to the points reserved.

The LORD CHANCELLOR said, it appeared to him that all the points reserved at the trial were confessedly plain, and came within the compass of the case for the purpose of appeal, if that appeal was prosecuted. He should consider matters as they were presented to him, and master them as far as he could exercise his judgment as to the validity of the patent, without sending it for trial at law again. If a trial was to take place, it would be a penal trial, and there was no reason for him to regard the assistance from a court of law in a right interpretation to bind the defendants with respect to the agreement, if he found it was right that they should be bound. If he should arrive at the conclusion that there was no power to bind the defendants, then he should save both parties from the consequences of trying the patent, as there was all that was material in the discussions in the Court of Exchequer to determine questions of law, and it was equally clear that certain questions were found by the jury which the Court of Exchequer refused to disturb.

Mr. BOVILL proceeded to argue that all the points might have been arranged in the Exchequer Chamber.

Mr. GROVE said that all the points in the Court of Exchequer involved certain facts; and, if the appeal was granted from the Court of Exchequer to the Exchequer Chamber, all those points could have been argued, and they might have a discussion upon them.

The LORD CHANCELLOR said, all the points reserved at the trial might be argued as grounds of appeal, save such points as were purely questions of fact.

Mr. GROVE dissented, and said he would take the first point, which was whether or not the invention was new? That was a question of fact for the jury, and also as to whether what had been done by Mr. Croll was an experiment, or had been done publicly, and that also had been decided by the jury. If it was decided that Mr. Evans should have an appeal, he would be put in the same position as if appealing to the Exchequer Chamber.

The LORD CHANCELLOR said, in considering the subject, it seemed to him that they should keep distinct the matters of law and of fact. Suppose it was said in the specification that hydrate oxide of iron would purify gas, and that it was not a new invention, that would have to be determined by comparison, and by comparing documents, with a view of ascertaining their generic forms, and whether it would accomplish their object. He thought, before they arrived at that conclusion, it was right that Mr. Grove should have directed him to all the points which were reserved at the trial, which were not properly matters of fact.

Mr. GROVE said, it might be necessary in the progress of this case to go beyond the specification, when that could be done by evidence that was indisputable. In addition, there were certain matters in dispute on each side which were questions that his lordship need not now go into, although he did not for a moment dispute his lordship's jurisdiction as the whole case was then before him. They might take up the case; and, when the evidence illustrated the specification, it was undisputed; and, where the evidence varied, or there was a difference, it became a question of law.

The LORD CHANCELLOR would rather give as great a latitude for argument as he could, as that was one of those cases in which the machinery of the law was complicated. He would call upon Mr. Bovill to proceed, and bring before him as to his right to address the Court of Exchequer Chamber.

Mr. GROVE said, he would help him to the best of his power, if not take his statement as admitted facts.

The LORD CHANCELLOR: Oh, certainly; and I will give you the fullest latitude.

Mr. BOVILL would say, unreservedly, that he was not about to argue matters of fact, provided they were admitted, but to raise the question, and illustrate them better than he had an opportunity of doing at the trial. There was a great deal of evidence to prove that Mr. Hills had seen and observed the experiments of Mr. Laming, but he did not propose to go into that, as those were pure matters of fact for the jury. With respect to matters of fact which depended on matters of law, it was clearly the duty of the judge to determine them. There were points of law reserved which dealt with matters of fact, and those the judge prevented from being considered, as he left them to the jury as matters of fact. There were some matters of fact which were clearly for the jury, such as that charge of Mr. Hills' having purloined this invention; and he would not attempt to argue that before his lordship, as that was a matter of fact, and, contrary to all expectation, the jury found a verdict against the defendant. He should think that really a great injustice had been done by the course adopted by the Court of Exchequer in arguing the question on a comparison of specifications. Many of the points were improperly left to the jury; and, if his lordship was called upon to determine what were questions of law, and what were questions of fact, he might properly have done so, but many of the points which were reserved were left to the jury; and he actually left to the jury the whole question of Croll's specification. It was the place of the judge to construe instruments, if he was in possession of facts which enabled him to judge of language used by the parties as to the meaning of the specification. There was chemical language used which was known to some of the judges, and to some it was unknown. He would take for ex-

ample: if a judge went for the first time into a county, he received parole evidence as to certain facts, and the same was required in the construction of wills, he requiring to be put in possession of facts, and the meaning of the language used, so as to be able to understand the intentions of the testator. Now, what they did understand was Mr. Hills' claim as his invention. It was the use of oxide of iron which, from its cheapness, was the principal ingredient used in the purification of gas from ammonia and sulphuretted hydrogen. Mr. Hills, in his patent, did not address himself to getting rid of the ammonia; and, for getting rid of sulphuretted hydrogen, various modes were known. The cheapest mode was by lime, in a wet or dry state. It was extremely cheap, and was practically adopted as the cheapest for gas companies; and, as long as gas companies were permitted to discharge the refuse of their works, including lime, into the Thames, they were content to use the cheapest material, and went on purifying gas with lime. As long as gas companies were permitted to discharge their materials into the great receptacle, they were content; but there were other persons, who took a different view as to the discharge of "blue billy" into the Thames. Lime was no longer the cheapest, and, as they had a great quantity of refuse, it became a very serious matter. Lime was discontinued, and then there became a pressing necessity for resorting to other plans for the purification of gas. Those means for purifying gas were not adopted because they were cheapest, but because they had to resort to other means of purification. Hills', Laming's, and Croll's patents were all for the purpose of getting rid of sulphuretted hydrogen from gas; and, after the companies were prohibited from discharging into the Thames, they turned their attention to some other mode, and it was found that oxide of iron was a very valuable ingredient for purifying gas from sulphuretted hydrogen; and it was now a great material used for that purpose. Mr. Hills claimed the invention of purifying gas by means of the hydrated oxide of iron. There was also another claim as to the hydrated oxide of iron, for the purpose of getting rid of the sulphur. Mr. Hills claimed these two matters by distinct and separate claims; and, if these inventions were not new, his patent was bad. They said that neither of them was new. He would, in the first place, address himself to his application of the hydrated oxide of iron. He said in his specification:—

My improvements in the purification of gas, and in obtaining certain products' consist of a method of purifying it from sulphuretted hydrogen, cyanogen, and ammonia, by passing it through the following porous material; and of renovating the material employed, after it has become inert; and of obtaining the sulphur, cyanogen, and ammonia (either alone or in combination) which were contained in the gas. I effect this in the following manner:—I take the subsulphates, the oxychlorides, or the hydrated or precipitated oxides of iron (which I prefer to use in a rather damp state), either by themselves or mixed with sulphate of lime or sulphate or muriate of magnesia, baryta, strontia, potash, or soda, and absorb them into, or mix them with, sawdust or peat charcoal, in coarse powder, or breeze, or other porous or absorbent material, so as to make a very porous substance easily permeable by the gas. This material is to be put into a purifier (such a one as is used for dry lime answers the purpose), and the gas is to be passed through it, whereby the gas will be deprived of its sulphuretted hydrogen, cyanogen, and a part of its ammonia, which will be absorbed into the porous material, water being at the same time formed by the union of the oxygen of the oxide and the hydrogen of the sulphuretted hydrogen absorbed.

He then went on further to say:—

The hydrated or precipitated oxides of manganese and zinc may be used in the same manner as described for the oxides of iron, though not with equal advantage. Hydrated or precipitated oxides of iron may be conveniently prepared for these purposes by decomposing sulphate or muriate of iron with hydrosulphuret of ammonia, or with lime, magnesia, potash, or soda; they may then be absorbed into, or mixed with, sawdust, peat, charcoal, or breeze, or other such material, and afterwards exposed to the air.

He then went on to say further:—

Thirdly, the purifying coal-gas from sulphuretted hydrogen, cyanogen, and more or less perfectly from ammonia, by passing it through the precipitated or hydrated oxides of iron, or the subsulphates or oxychlorides of iron, from whatever source obtained, either by themselves, or, which is much better, made into a more porous material, by being absorbed into or mixed with sawdust, or breeze, or peat charcoal in coarse powder, or other porous or absorbent material, so as to be readily permeable by the gas, and either used alone, or mixed with sulphate of lime, or sulphate or muriate of magnesia, potash, or soda, or in conjunction with any other purifying material at present in use for a similar purpose. But I do not claim peroxides of iron or manganese made at a red heat, or the oxide of iron mixed with chloride of calcium, or with the muriates and sulphates of manganese, iron, and zinc, and absorbed into sawdust.

He did not claim these matters, because they had been anticipated by other and previous patents. It was manifest that Croll knew that oxide of iron was used, and Laming also knew that it was used for purifying gas from sulphuretted hydrogen. He would place his lordship in possession of the evidence, to enable him to understand the evidence as well as he could, as he had gone through the voluminous mass of evidence which was taken at the trial. The first point to be established on the defendant's side was, that it was well known before, by Heard and Croll, that hydrated oxide of iron would absorb sulphuretted hydrogen, and it was well known to other persons. The evidence upon that point was undisputed and clear. He would read what was said by Dr. Odling, who was their witness, and then he would read the evidence of a witness on the other side. Dr. Odling said:—

Mr. Bovill: Prior to 1840, was it well known that hydrated oxide of iron would absorb sulphuretted hydrogen?
Witness: It was.
Mr. Bovill: I will just call your attention to Mr. Croll's patent—you have seen that? I believe you have a copy of it?
Witness: I have.
Mr. Bovill: With the knowledge that was common in 1840 to chemists, would you, or any one else, infer from the mention of "oxides of iron," that it was the hydrated, or anhydrous, or both?
Witness: I conclude that the term "oxides" would include both anhydrous and hydrated. Were I to try experiments, I should certainly select the hydrated.
Mr. Bovill: Having that in your hand, you would have taken the hydrated?
Witness: Yes; having to try experiments, I should take the hydrated, from my knowledge that it was most likely to succeed.

He would now come to the evidence of Dr. Alfred Swaine Taylor, who was a witness on the other side. He said:—

Mr. Bovill: As far back as 1840, and before that, was it known by you that hydrated oxide of iron would absorb sulphuretted hydrogen.
Witness: It was.
Mr. Bovill: And known to chemists of ability and experience besides?
Witness: Yes.
Mr. Bovill: Was it also known that anhydrous oxide of iron would not do so?
Witness: I believe it was so; that it would not do so, except under certain circumstances, by the application of heat.

The next evidence to which he should refer on this point was that of Mr. Herapath, of Bristol. Mr. Denman put to him the following questions:—

Mr. Denman: We have heard that it was known before Croll's patent in 1840, that oxides of iron would absorb sulphuretted hydrogen?
Witness: Both oxides of iron—both the hydrated and the anhydrous.
Mr. Denman: That was known before?
Witness: It was published as early as 1839, by Berzelius, in his work.

We have thus shown that it was known as early as 1839; and Dr. Odling's evidence upon that point was confirmed by Mr. Thompson, Mr. Warington, and also by Professor Miller. It was confirmed by the latter in these terms:—

Baron Bramwell: In the plaintiff's purifier, the oxide of iron is in mere mechanical combination with the other materials?
Witness: Yes.
Mr. Bovill: And any chemist would know perfectly well, before 1849, that hydrated oxide of iron, in mechanical combination, would absorb sulphuretted hydrogen from gas—would not they?
Witness: I do not know.
Mr. Bovill: Do not you know?
Witness: No; it was known before that time as a chemical fact.
Baron Bramwell: It was known before his patent that hydrated oxide of iron, in mechanical combination with other things, absorbed sulphuretted hydrogen?
Witness: Yes.

Having established that point, he might consider it as settled. Another matter to which he wished to direct the attention of his lordship was the state of the oxide of iron. The rust on iron, when exposed to the air, was a common form of oxide of iron. That was the hydrate of iron; and, if they wanted to get rid of the hydrated portion of the oxide, it was to be subjected to a red-hot heat, to drive out the water. Then, there was the carbonate of iron, which, being mixed with the oxide of iron, enters into a chemical combination; but the carbonate went away, and they could scarcely prepare pure carbonate of iron, as the atmosphere reduced it to oxide of iron; and, if they went to a chemist, and asked for carbonate of iron, they would get oxide of iron. That inquiry might become material when he should come to discuss Laming's specification. Hydrated oxide of iron was the ordinary state; and, if they were to send to Apothecaries Hall, they would get hydrated oxide of iron; and, if they sent to a chemist's shop, and asked for carbonate of iron, they would get hydrated oxide of iron. Mr. Campbell was the witness for the opposite side, and he thought he could not do better than quote his evidence:—

Mr. Bovill: Both hydrated and anhydrous oxides of iron are found in nature, are they not?
Witness: They are.
Mr. Bovill: And are also produced artificially, are they not?
Witness: They are also produced artificially.
Mr. Bovill: The ordinary state of oxide of iron, produced artificially without the application of heat, is it not the hydrated state, such as you see in iron exposed to the atmosphere?
Witness: It is.
Mr. Bovill: And then the anhydrous oxide is produced by the application of heat, is it not?
Witness: Hydrated oxide of iron, by even the action of the atmosphere, might lose water—not in a very moderate temperature—but still it is possible to some extent.

That was Mr. Campbell's evidence upon the subject. He now desired to refer to another fact, as to the language set out in the specification. At the time Mr. Croll's patent was taken out, it was supposed that anhydrous oxide would not absorb sulphuretted hydrogen, and on that point he would refer to the evidence of Dr. Taylor, who said:—

Mr. Bovill: Was it also known that anhydrous oxide of iron would not do so?
Witness: I believe it was so; that it would not do so, except under certain circumstances, by the application of heat.
Mr. Bovill: There are some hydrated oxides of iron, you told us, that will purify; are there some hydrated oxides of iron that will not purify?
Witness: The native hydrated oxides will not readily purify; they do better than the anhydrous oxides, but still they could not be practically used.

He would here observe that they said that anhydrous oxide would purify, while Dr. Taylor believed at the time that it would not have that effect. He did not say he supposed that it would not, but he spoke positively, and said that it would not. They had proved that an anhydrous oxide would purify, and we might almost say that it would do so as well as hydrated oxide. They contended at the trial, and would contend that day, that anhydrous oxide would not purify gas from sulphuretted hydrogen, and Professor Taylor had stated also that it would not purify gas in the answer he had just received. They found that, in 1840, a patent was taken out by Mr. Croll for certain things, and, with the knowledge possessed by Dr. Taylor, they came to the specification of Mr. Croll. They also had seen the language he employed for the persons who were acquainted with those chemical combinations which he wished to be conveyed to their minds. It would then be convenient to take up Heard's patent, when he had to refer to the order of dates. Now, Mr. Heard took out his patent in 1806, but it did not appear to have been carried into operation for the reasons which he had already stated, that lime was cheaper. The learned counsel read an extract from the specification, in which he stated that he used oxide of iron, as it had an affinity to sulphuretted hydrogen, by which he got rid of offensive smells. He ventured to submit that all the principle for which they contended was contained in that patent, and after that statement it would be impossible for Mr. Croll, or any one else to take out a patent to get rid of the bad smell of sulphuretted hydrogen by oxide of iron. His lordship had before him a patent for the use of the oxide of iron, because there was an affinity for sulphuretted hydrogen as it could get rid of the offensive smell. It might be said, "I choose to use that as I obtained a patent for it in 1806, and will pass gas through it, as the use of lime by sanitary regulations is now prohibited." Then he came to the question what was Heard to do? If they took chemical persons, they would know the chemical affinities which appeared on the face of the specification—they would know that oxide of iron had an affinity to sulphuretted hydrogen. The fact was well known to chemists, who understood that oxides had an affinity to sulphuretted hydrogen. To say that oxide of iron had an affinity for sulphur and sulphuretted hydrogen, was language addressed to chemical persons, as, at that time, hydrated oxide of iron was the only oxide of iron known to have an affinity to sulphur and sulphuretted hydrogen. He would produce evidence from both sides on this point, and would leave his learned friend to produce evidence on the other side if he could, but he (Mr. Bovill) knew very well that he could not. Now, in dealing with Heard's patent, what were the oxides of iron he referred to? Why, it was plain he referred to such oxides of iron as had a sufficient affinity to sulphuretted hydrogen. Well, what oxides of iron, at the trial, were known to have a sufficient affinity to sulphur? His learned friend said that anhydrous oxide had not. His learned friend could not blow hot and cold in the same breath. Mr. Hills said it would not; and he would read a passage in Mr. Hills' evidence which was conclusive against him. He was asked, "Have you ever made use of the anhydrous—of your privilege in that re-

spect?" and his answer was, "No; it will not purify at all." That answer would suit his purpose, and he would take it to that extent, and, although the evidence given afterwards did not carry it quite so far, yet Mr. Hills swore point blank that it would not. He, therefore, had referred to the challenge of his learned friend on that point, that it was known at that time that anhydrous oxide would purify gas. Again, Mr. Hills was questioned upon this point, and gave this evidence:—

Mr. Bovill: Do you find that the native hydrated oxides will not purify gas?
Witness: I believe some of them will not; but I believe there are some of the ironstones which are hydrated. I am not sufficiently a mineralogist to know whether they are all hydrated.
Mr. Bovill: Have you never tried?
Witness: No. There may be some iron ores which may be in a state of hydration.
Mr. Bovill: Do you not know there are some anhydrous, which will purify?
Witness: I know they will not.

That was the evidence of his learned friend's client and the patentee. Such being so, his (Mr. Bovill's) argument was conclusive and irresistible; and, when Mr. Heard used the words "oxide of iron," and Mr. Hills read those words, he must have known that those words meant hydrated oxide of iron, and no other. They were then dealing with Heard's patent, which was taken out in 1806. He would now beg to refer his lordship to Professor Miller's evidence, which was also confirmatory that hydrated oxide was well known to be applied to coal-gas. It was taken that there were certain oxides of iron which were known to have an affinity to sulphuretted hydrogen. They dealt with that commonly known as oxide of iron, and that it would absorb sulphuretted hydrogen; and, he asked, how could they escape from the construction of the position taken from Heard, that it had been used ever since 1806? Supposing Hills' patent was to rest on the use of hydrated oxide of iron, and, if there was any validity in his learned friend's argument, Heard might proceed against Hills, and say that that was what he had patented, and gave to the world in 1806.

The Lord Chancellor said he took it, from the reference given to him, that, before 1806, the common and ordinary oxide of iron would absorb sulphuretted hydrogen. That, according to the general state of chemical knowledge at the time, it was the hydrated oxide; and that Mr. Heard, who had applied his knowledge to the purification of gas, had told the world that they might purify gas by the application of the common oxide of iron.

Mr. Bovill said, it was upon that for his lordship to say in reference to Heard, looking at the specification with the knowledge essential to the state of facts at that date, and the construing of it, whether hydrated oxide was included in the oxide of iron. His lordship would have now to exercise the functions of judge and jury, and he congratulated his clients that he would now have all the facts presented to the same mind. If there was to be one mind to determine it, accustomed to legal and judicial investigation, it was immaterial by whom it was to be determined. He (Mr. Bovill) had abstained from going into a vast variety of matters which did not touch his proposition, for let him take their own witnesses, or the witnesses on the other side, it would be found that there was no difference between them. The question was, what was the meaning of the words "oxide of iron," and whether Heard claimed the invention of the application of the oxide of iron as having an affinity to sulphuretted hydrogen? and it would be impossible to escape from that proposition. He then came to Croll's patent, which was taken out in 1849. Before he addressed himself to what was contained in it, he would introduce, as a matter of fact existing and published in a paper before 1840, the fact that the affinity of oxide of iron for sulphur and sulphuretted hydrogen was known before 1840, and that the affinity of oxide of iron for sulphuretted hydrogen had been applied to the purification of gas; and, if that was an incontestable fact, it proved Heard's patent. It had been given to the world, and was a matter of knowledge. The principle of the affinity of the oxide of iron for sulphuretted hydrogen, and that it might be applied to gas, had been given to the world, and the public had been told that a patent had been taken out for it. What would be the effect on Croll's patent, in reference to the facts he had stated? He had established the principle that it was known that oxide of iron would absorb sulphuretted hydrogen, and these were matters of importance, as it was said, that although it was known, yet no one had applied it to gas. That was a mistake, for it had been applied to gas, and it would be an important ingredient in dealing with the question of Croll's patent. It was stated at the trial that oxide of iron had an affinity for sulphuretted hydrogen, but his learned friend said that it had never been applied. They had, however, now introduced another fact, which was, that it was published to the world, and was applied to gas by Heard; he had told the world they could apply the oxide of iron to the purification of gas. Therefore, Croll's patent, and all others, must be considered in reference to that patent, independently of points of law as to any other patent. The practical consequences were, that in respect of Croll's and the other patents, his lordship would deal with the facts in the altered state of the circumstances, in reference to the introduction of Heard's patent. On a former occasion, his learned friend had an immense advantage, but as it was now known that oxide of iron had been applied to get sulphuretted hydrogen out of gas, that would be a powerful argument to be inquired into before the judge and jury. That was now before the court, and his lordship might take Croll's patent, and the further facts, that it was known and stated to the world that the principle might be applied to the purification of gas. His lordship would also ascertain the meaning of Croll's patent, with the fresh introduction of Heard's patent, and deal with such as matters of fact, if they were proved to be so. The introduction of so important a fact must necessarily deprive his learned friend of a great argument, and must be considered in reference to Croll's patent. He would now come to Croll's patent; and he found that in page 2 of his specification he said, "My invention consists: first, in the methods of purifying coal-gas from ammonia by the application of certain salts, acids, and oxides, hereinafter described." It was somewhat remarkable even here that Mr. Croll used the word "oxides;" not that he had discovered it, but treated it as a matter that was known. He then went on to say in the 4th page of the specification, "The third part of my improvements in the manufacturing of coal-gas consists in the application of the black oxide of manganese to remove or free coal-gas of sulphuretted hydrogen, which is accomplished in the following manner." Before he called his lordship's attention to the manner in which this was to be done, he would go to the 34th line, in which it was stated, "The same effect may be produced by the application of the oxide of zinc, and the oxides of iron, and treated precisely in the same way as above described," which was with black manganese. He described the manner of applying his patent as follows:—"After the gas has been freed from ammonia, as described, it is then to be passed through a ves sel similar to those now in use for the purification of coal-gas by what is denominated dry lime, and charged in a similar manner with black oxide of manganese in powder, moistened with water to about the same consistency. The period required for each charge is to be ascertained and regulated by the same tests as if dry lime were used, and which is well understood; in short, requiring no further alterations, except in the materials I employ for the absorption of the sulphuretted hydrogen." He would now pass on to another part of the specification, in which he said, "I claim the purification of coal-gas from ammonia by means of chloride and sulphate of manganese, and muriate of iron, and sulphuric and muriatic acids, and the purification of gas from sulphuretted hydrogen by means of the oxide of manganese, the oxides of iron, and the oxide of zinc, as applied in the particular manner and stage of the process of manufacturing of coal-gas hereinbefore mentioned, and not otherwise." Throughout, he treated sulphuretted hydrogen as known to have an affinity with oxide of iron; and he was quite right, because it was combined in the discovery of Heard, who had even claimed a patent for its application, which would not allow him to exercise Heard's patent without a licence; but, as that has expired, he set about applying the oxides in this way, and treated their application to gas as a matter well known years before Hills, Croll, or Laming applied them in the way described. In Croll's specification, it was treated as a matter well known. In Heard's patent, there was a declaration that oxide of iron had an affinity to sulphuretted hydrogen, and he would submit that hydrated oxide of iron might have been used; and, as to hydrated oxide of iron and anhydrous oxide of iron, Mr. Croll was a practical gas manufacturer, and had not the least notion that there was any difference between anhydrous and hydrated oxide of iron. No one at the time knew it, unless thoroughly acquainted with the subject, and Mr. Croll was in that happy state to find out by using heat it would produce a certain result.

The Lord Chancellor presumed this argument was to induce him to come to the conclusion that oxide of iron must be qualified in reference to the external knowledge or supposed knowledge at the time, and the strict point was, where was the argument that would prove first that principle of interpretation? The second point he should require to be proved was, how he knew by extrinsic facts that it would determine, in ordinary men's minds, the meaning of the words "oxide of iron?"

Mr. Bovill said, as regarded Mr. Heard, it was a matter of fact. As it was a matter beyond all dispute, the judge or jury must be in possession of all the facts.

The Lord Chancellor said, it could not be better expressed.

Mr. Bovill went on to say there was no knowledge at the time of the difference between anhydrous and hydrated oxide of iron; and, if they were to go to Savory and Moore's and obtain the article, no one would be able to tell the difference, except upon the closest examination; and, whether they talked of oxide of iron, or of hydrate of iron, they would get the same. The question was not what was in the mind, but what was conveyed to other people? If certain results were produced by certain acts, and a man should say, "You can do so and so," it was not necessary that he should understand why he could do so. It was not what Mr. Croll understood, but what would be understood by other persons to be done on reading the specification of Mr. Croll when presented to them. He should show what eminent men would have done. Dr. Miller, who was their witness, and Dr. Odling, who was his own witness, had told them that they could purify gas from sulphuretted hydrogen by means of oxide of iron, and that they would have taken hydrate of iron, or they would have taken anhydrous oxide of iron. There was practically no distinction between them; but, would Dr. Odling have known the affinity of oxide of iron for sulphuretted hydrogen, or would any other competent person have done so on reading Mr. Croll's specification? He would answer that by the evidence on both sides, that competent persons, after reading the specification, would have taken hydrated oxide of iron, and, if he showed that, Mr. Hills could not take out a patent for what he had been induced to do from what Heard had set down for them. For it to be stated that because it was not said that it was to be done by hydrated oxide of iron, but by oxide of iron, it had no reference to this, was too monstrous a proposition to be for a moment entertained. Then, as to the use of anhydrous oxide of iron, Dr. Odling gave upon it some evidence, which he would read:—

Mr. Bovill: With the knowledge that was common in 1840 to chemists, would you or any one else infer, from the mention of "oxides of iron," that it was the hydrated or the anhydrous, or both?
Witness: I conclude that the term "oxides" would include both anhydrous and hydrated; were I to try experiments, I should certainly select the hydrated.
Mr. Bovill: Having that in your hand, you would have taken the hydrated?
Witness: Yes; having to try experiments, I should take the hydrated from my knowledge that it was most likely to succeed.
Mr. Bovill: From the property it was known to possess?
Witness: From the property it was known to possess.

He gave as his reasons that he knew hydrated oxide of iron would absorb sulphuretted hydrogen, and that it was known that anhydrous oxide of iron would not absorb sulphuretted hydrogen; but he said some would take hydrated oxide, as it was known to have an affinity to sulphur; yet it was not of a necessity that they should take hydrated oxide of iron. Dr. Odling merely thought they would take the hydrated oxide, and not anhydrous, as he knew one had an affinity, and that the other had not.

The Lord Chancellor said they must consider what was the state of knowledge in 1840.

Mr. Bovill said he would then read the statement on the other side—which was that of Dr. Miller—and let them see what he said on the subject:—

Mr. Bovill: I now beg to call your attention to my view of that specification. In the first place, you have told me that it was known that hydrated oxide would absorb sulphuretted hydrogen?
Witness: Yes.
Mr. Bovill: Finding the expression, that oxide of iron is to be used to absorb sulphuretted hydrogen, should you not have tried hydrated oxide?
Witness: I should.

He was further asked, "Was it known before 1840, that hydrated oxide of iron would absorb sulphuretted hydrogen?" and his answer was, "It was." He said, without knowing whether anhydrous oxide of iron would or would not absorb sulphuretted hydrogen, unhesitatingly and at once, that, upon reading Mr. Croll's specification, he should have taken hydrated oxide, as he knew hydrated oxide would absorb sulphuretted hydrogen, and that anhydrous would not. It was common knowledge, that hydrated oxide would absorb sulphuretted hydrogen; and, therefore, it was not necessary that he should know the difference between anhydrous and hydrated oxide of iron. Dr. Miller and Dr. Odling, on reading Mr. Croll's specification, said they would take the hydrated oxide of iron; but, would it be tolerated for a moment, if they were to say, "Mr. Croll, you have not stated that it is to be hydrated oxide of iron, but merely oxide of iron, and, therefore, we will go and take out a patent?"

The Lord Chancellor wished to know if Mr. Heard, when speaking of the oxide of iron being applied to the purification of gas, and that he gave the world to understand that he was speaking of hydrated oxide of iron,

how it was that the learned counsel had managed to conceal that during the seven days this case was before the Court of Exchequer?

Mr. BOVILL said, he thought first to dispose of cases of comparison of specifications.

The LORD CHANCELLOR: In reading Heard's specification by the light of the law of nature, is it intended to read the general term of oxide of iron as intended to indicate hydrated oxide of iron?

Mr. BOVILL said, that point would determine the whole matter.

Mr. GROVE said, his learned friend had pleaded that argument in the Court of Exchequer.

Mr. BOVILL said the argument of his learned friend was, that the oxide of iron had not been applied to the purification of gas. It was contended, in reference to Mr. Croll's case, that oxide of iron necessarily meant anhydrous oxide, but there was not a word of that in Heard's specification. His learned friend's answer to it was, that competent persons would take it that, as Mr. Croll was using a red heat, it must mean anhydrous oxide, and would not interfere with Mr. Hills' patent for hydrated oxide of iron.

The LORD CHANCELLOR: I shall try this case on the arguments I hear in this court, and not on what has taken place elsewhere.

Mr. BOVILL said, there was a passage in Dr. Miller's evidence, to which he wished to call his lordship's attention. It was on his re-examination by the Attorney-General:—

The ATTORNEY-GENERAL: You yourself, as a scientific chemist, say that you, knowing that the hydrated oxide will absorb sulphur, and the anhydrous oxide will not, if you were attempting, by any process whatever, to absorb sulphur, you would begin with the hydrated oxide?

Witness: Yes.

This was the opinion of a competent witness, who said he would try the hydrated oxide; but it was contended that, as it did not say hydrated oxide in Mr. Croll's patent, Mr. Hills could take out another patent for it. If Mr. Hills were, then, to take out a patent for purifying gas by oxide of iron, he might then charge Mr. Croll with an infringement of his patent, for that would be the result. The oxide of Croll's patent was the anhydrous oxide of iron; but, if they went to a chemist's shop and asked for it, it would be produced as hydrated oxide of iron. When the court had the knowledge of the state of the facts, with that knowledge it had all that was necessary for the purpose of construing the documents, and it rested with the court to construe the specification. Evidence had been given by those who had described Croll's patent, that it meant anhydrous oxide, and not hydrated oxide, for it was roasted in an oven until it came to a red heat; and that it was clear he meant anhydrous oxide, which would be produced, and which he did not dispute. They said that anhydrous oxide would not purify gas; but it was proved on the defendants side, that for months it was used, that the oxide was subjected to a heat until the sulphur was expelled, and that it had been used for the purification of gas up to the present time.

The LORD CHANCELLOR: Will not that destroy all you have been labouring up to the present time?

Mr. BOVILL said, he thought not; for, since 1856, anhydrous oxide had purified gas from sulphuretted hydrogen. It placed them in this dilemma, that they said Croll did not know the distinction between anhydrous and hydrated oxide; but all the witnesses, on reading Croll's specification, said they were told to take oxide of iron, and that they should at once have taken hydrated oxide. All the evidence of one party was, that the meaning would be proved by the specification; but all knew that Mr. Croll was not aware of the difference between hydrated and anhydrous oxide of iron. They had now the reasons of the witnesses, because, they said, that Mr. Croll required the oxide to be roasted to a red heat, which would make the oxide anhydrous. Taking that knowledge, it was not necessary to have any one but his lordship to determine the meaning of the specification.

The LORD CHANCELLOR said, they had Heard's patent, Croll's patent, Laming's patent, and Hills' patent. Now, suppose he produced a book published in 1790, in which he found it written that hydrated oxide would absorb sulphuretted hydrogen; in 1806, another book was published, which said that oxide might be used for the purification of gas from sulphuretted hydrogen; if he found, in 1840, in another book, that oxides of iron were so applied, and, after they ceased to answer the purpose, if they were subjected to a red heat, they might be applied to the same purposes—then, he would ask, were those all the materials that had been used for purification of gas?

Mr. BOVILL assented, and he proceeded to say, that he would call the attention of his lordship to all that had been said on both sides of the question. Their evidence went to show that Mr. Croll's specification must mean anhydrous oxide, because he afterwards described the heating of the oxide of iron to a red heat; and there was a good deal of evidence at the trial as to the heating to expel the sulphur, but he would not trouble his lordship with that. On one side, he would read what his witnesses said, and then read what was said on the other side. He would first take the evidence of Dr. Odling, on the questions put to him:—

Mr. BOVILL: Prior to 1840, was it well known that hydrated oxide of iron would absorb sulphuretted hydrogen?

Witness: It was.

Mr. BOVILL: I will just call your attention to Mr. Croll's patent—you have seen that—I believe you have a copy of it?

Witness: I have.

Mr. BOVILL: With the knowledge that was common in 1840 to chemists, would you or any one else infer, from the mention of oxides of iron, that it was the hydrated or the anhydrous, or both?

Witness: I conclude that the term "oxides" would include both.

He would then take the evidence of Mr. Lewis Thompson, who was cross-examined by the Attorney-General:—

The ATTORNEY-GENERAL: I will just call your attention back to Mr. Croll's patent. Do let me clearly understand you. Do you take Mr. Croll's directions to apply to hydrated or to anhydrous oxide?

Witness: I should think, if I were left to infer this merely from the terms of the patent itself, from the early part, from the first part of the patent, that he meant hydrated oxide of iron. I infer that from the fact that the oxide of manganese, which he specifically points out as a metal, is a hydrated oxide of manganese; consequently, I infer that the oxides of iron are also to be hydrated.

The ATTORNEY-GENERAL: But as you say, upon its being made red hot, it becomes anhydrous, I suppose it would not be worth doing if it were for one purification only, so that the process has to be repeated. Do not you understand that the thing to be in general use is to be anhydrous?

Witness: I do for the second use. The second use is anhydrous, and hence it is that I am able to give a meaning to the expression "oxides."

The ATTORNEY-GENERAL: The second, and all subsequent uses?

Witness: Are anhydrous; hence it is that I am able to give a meaning to the expression. Mr. Croll states that he uses oxides of iron—that is the expression—consequently, I infer that he means both hydrated oxides, which is one, and anhydrous, which is the other.

That was the sort of evidence taken by counsel, which might assist his lordship in coming to a conclusion. He would call attention to what was stated by Professor Miller, who was a witness for the plaintiff:—

Mr. BOVILL: Did you state upon the last occasion, that oxides generally are claimed by Mr. Croll?

Witness: I really do not recollect at this distance of time; perhaps, you have it before you?

Mr. BOVILL: That is the reason that I am asking. Did you state, upon the last occasion, that oxides generally are claimed by Mr. Croll?

Witness: Perhaps, I might; I have no objection to state it again.

Baron BRAMWELL: Suppose you ask him whether he says so now.

Witness: I do.

Mr. BOVILL: Both hydrated and anhydrous?

Witness: Yes, the term "oxides" implies everything.

Therefore, the question stood thus: if they took the meaning of the word in Mr. Croll's patent, the "oxides" of iron, the word so employed meant both oxides, hydrated and anhydrous; and, if they were to take a competent person like Dr. Miller, he said that after, reading Mr. Croll's specification, he should at once, and without hesitation, take hydrated oxide of iron. Now, Mr. Croll claimed both oxides, and here they had Dr. Miller stating in his evidence that the word "oxides" meant both oxides of iron, but, as a competent man, he should have taken hydrated oxide. How, then, could it be conceived that when a competent person said, on reading Mr. Croll's specification, that he would at once have used hydrated oxide, that by Mr. Hill's patent, Mr. Croll was to be excluded from the use of it. He (Mr. Bovill) ventured to submit that if competent persons said it was impossible to come to any other conclusion than that, Mr. Croll had meant them to take hydrated oxide of iron, there was an end of Mr. Hills' patent. Mr. Croll knew no difference; and, down to the time of the trial, Dr. Taylor, Dr. Miller, and all the other witnesses, were ignorant of the fact that anhydrous oxide would purify gas. It turned out that both would purify gas, and there was no substantial difference between the two, whether it was hydrated or anhydrous. In the first place, Mr. Croll, in his evidence, described the use of hydrated oxide of iron, but, by roasting it, it then became anhydrous, and could be used in the way he described. He should read the evidence of Mr. Croll in detail hereafter, to show how he first used hydrated oxide, and then by roasting how it became anhydrous. He would now read the evidence of Dr. Odling:—

Baron BRAMWELL: Do you mean that the preparation, after being treated as Mr. Croll has stated he treated it, you believe would practically purify?

Witness: I feel quite certain of it.

Mr. BOVILL: From the experiments that you have made upon the subject?

Witness: From the experiments I have made on the subject.

Mr. BOVILL: I will just take Mr. King's case; you heard the evidence, I dare say?

Witness: I did.

Mr. BOVILL: From the experiments you made, are you of opinion that hydrated oxide of iron used for the purpose of purifying gas, and then brought to a red heat, so that the sulphur is expelled, and it is revivified in that way, would again purify gas?

Witness: I am quite certain that that is the case, because I experimented with some of Mr. King's material; I made it red hot myself.

He would now pass to another part of his evidence:—

Mr. BOVILL: Now, I will pass to Mr. Croll's patent. I think that you tell me, if it is heated to a red heat it will still purify, whether you heat it to a red heat or not?

Witness: Yes.

It was clear, therefore, that, when the oxides of iron were brought together with sulphuretted hydrogen, there was a combination with the sulphur; and, on being exposed to the air, they got oxide of iron; and, if they wanted oxide of iron, they would get it in mechanical combination with sulphur; and it turned out, from the evidence, that the sulphur distilled off, and passed into the air at even less than a red heat.

The LORD CHANCELLOR: It is not necessary that the heat should be a red heat.

Mr. BOVILL said, there was a good deal of evidence at the trial as to whether Mr. Croll's specification meant heating to a red colour or red heat. If the oxide was heated to less than a red heat, the sulphur would pass away; but it would not, unless made to a red heat, become anhydrous. It was stated by Dr. Miller, in his evidence, that a good deal would depend upon the molecular condition as to the difference between hydrated and anhydrous oxide; and, in the cross-examination of Dr. Odling by the Attorney-General, he gave this evidence:—

The ATTORNEY-GENERAL: Have you ever—I am not speaking again of a single experiment, or two or three upon a small scale—but have you ever yourself attempted to apply the language of this patent, or the process of this patent, pointed out by this part of Mr. Croll's specification, upon a large scale, in the actual purification of gas?

Witness: Not on a large scale—upon a very small scale; but, in the actual purification of gas, I have tried it.

The ATTORNEY-GENERAL: But not on a large scale?

Witness: No.

The ATTORNEY-GENERAL: Where, and when was it?

Witness: I tried experiments at the London Gas-Works, at the Chartered Gas-Works, and at my own laboratory.

The ATTORNEY-GENERAL: To what extent? did you put it into the small purifiers, or what?

Witness: I took the crude gas containing sulphuretted hydrogen, and passed it over some of those different substances, and ascertained whether or not, when it had passed over those substances, it still contained sulphuretted hydrogen.

The ATTORNEY-GENERAL: What substances?

Witness: I have used peroxide of manganese; I have used some of the stuff which Mr. King gave me; and I have used several samples of anhydrous oxide which I had prepared myself.

The ATTORNEY-GENERAL: What did you put them into?

Witness: Glass vessels.

The ATTORNEY-GENERAL: Tubes, I suppose?

Witness: Some were tubes, and some were vessels of a different character, about 2 feet in height.

The ATTORNEY-GENERAL: Did you heat the substance afterwards? Did you go through the subsequent process, because, you know, "the material, after it ceases to absorb the sulphuretted hydrogen, is to be removed and roasted," and so on? Did you go through that process?

Witness: Yes.

The ATTORNEY-GENERAL: Did you heat it to a red heat?

Witness: Yes; the mass became thoroughly red, from the ignition of sulphur; the sulphur caught fire, and the whole mass became thoroughly red hot.

Mr. GROVE said that these matters were not properly before his lordship, as he understood that his learned friend was not to go into facts which were laid before the jury.

Mr. BOVILL then referred to the use of anhydrous oxide, and said if it turned out that anhydrous oxide would act as well as hydrated oxide of iron, there would be no necessity whatever for Mr. Croll to make any distinction in his specification. According to evidence of Dr. Odling, he said he had used both anhydrous oxide and the hydrated oxide; and, having made experiments with them on a small scale, he was not prepared to say

which of them was the best for the purpose. Then, there was the evidence of Mr. King, the engineer to the Liverpool Gas-Works, who stated that he had used the anhydrous oxide—having used it twenty-two times over, and found it most effective. Mr. King said he had used anhydrous oxide of iron up to the latter part of 1856—the oxide having been exposed to heat, to drive out the water; and Dr. Odling, in his evidence, said that anhydrous oxide would purify gas just as well as the hydrated oxide, and that it would last for a considerable time. He would now refer to the evidence of Mr. Lewis Thompson upon this point. The question was by Mr. Webster: "With reference to this distinction of oxides of iron into hydrated and anhydrous, will hydrated oxide of iron that has been used for purifying gas, if brought to a red heat, still purify gas?" His answer was: "Yes, undoubtedly; it then becomes anhydrous, and will then purify gas." Dr. Thompson, on being cross-examined by the Attorney-General, gave this evidence:—

The ATTORNEY-GENERAL: Have you ever known any gas manufactory—any company for the manufacture of gas, purify the whole of their gas with anhydrous oxide of iron?

Witness: I have known this. A large proportion of the gas at one of the Liverpool stations is purified by means of anhydrous oxide, that is, by means of anhydrous oxide or roasted oxide; that constitutes a very large proportion of the material employed.

The ATTORNEY-GENERAL: Are you speaking of Mr. King's?

Witness: I am.

The ATTORNEY-GENERAL: We have heard of that.

Witness: No; that of which you have heard of Mr. King's relates to a station with which I have no relation.

The ATTORNEY-GENERAL: Where is it that you have known the anhydrous oxide practised for a considerable time?

Witness: In respect to the Liverpool Gas-Works, at what is called the Eccles Street station of the Liverpool Gas-Works.

The ATTORNEY-GENERAL: What is that oxide? can you tell me the whole of it—what the whole material is which, being anhydrous, you found used there. Of course, you are speaking from your own knowledge? Just describe to me the whole of the material, what it really was that you now speak of as anhydrous, and by means of which, permanently the whole of the gas at that station was purified.

Witness: Not permanently, at that station the whole of the gas. I said a very large proportion permanently.

The ATTORNEY-GENERAL: What proportion? and for how long?

Witness: It has been, in fact, gradually increasing under my own request, and at the time I speak of, constituted a third or more of the total quantity of the material employed at the works.

The ATTORNEY-GENERAL: What was the other material?

Witness: The other material contained hydrated oxide also; but the two were not kept in the same purifiers; they were not mingled together.

The ATTORNEY-GENERAL: Then your anhydrous was used to about the extent of one-third of the gas manufactured?

Witness: Yes.

The ATTORNEY-GENERAL: What quantity was that? and how long did it continue?

Witness: That has been going on probably for a year and a half, and, therefore, it would be impossible to say, unless I referred to the books of the company, the quantity of gas manufactured and so purified. It is in practical operation—constantly in use.

Thus, Mr. Croll's anhydrous oxide had been used by Mr. King for a year and a half at the station at Liverpool; and, after the evidence of Doctor Odling and Mr. Thompson, at the present time to set a distinction between hydrated and anhydrous oxide of iron was perfectly ridiculous. Professor Miller said, having read Mr. Croll's specification, he would most unhesitatingly, and at once, have taken hydrated oxide of iron; and, if that was so, that could not be patented by Mr. Hills at all. He would claim both oxides, for the general term included both, and both were applicable to the purification of gas. Therefore, Mr. Hills could not take either of the oxides, which were both included in the general term of "oxides of iron." In that state of things, hydrated oxide of iron stood in the first place, and, in the second, anhydrous oxide; but Mr. Hills could not claim a patent for either.

The LORD CHANCELLOR said, according to the present state of human knowledge, oxide of iron would absorb sulphuretted hydrogen, and it was also proved that it might be absorbed by natural or artificial oxides.

Mr. BOVILL said that was true.

Mr. GROVE remarked that the same principle extended to manganese oxides.

Mr. BOVILL said, no one in the course of the case heard of manganese oxides as having anything to do with it. It had no connexion with the purifying of gas, and was, indeed, not introduced at all.

Mr. GROVE replied, that what they said was, that some of the anhydrous oxides would not purify; and, if it was wished that they should be ascertained, he would give his lordship a book which would show that there are a great number of them; but, if he took the evidence, it would not do for his learned friend to say that some would purify gas, and some would not.

Mr. BOVILL said, in Mr. Croll's specification it was stated that oxide of iron, on being brought to a red heat, becomes anhydrous, and will purify gas; and, therefore, Mr. Hills, for the first time, found out that it would do so. It was shown by Mr. Croll's process that it would produce anhydrous oxide, and that, so produced, it would purify gas. Mr. Croll had described hydrated oxide in the first place, and anhydrous in the second; and the other side have described one that would do so, and one that would not do so; but they had proved that both would do.

The LORD CHANCELLOR said, according to Mr. King's evidence, Mr. Croll's patent was a very valuable discovery; for, after the hydrated oxide had been exhausted, it might be revivified by exposure to the atmosphere; but, if it would not perform its functions, that they might roast it, and revivify it from time to time. Mr. Bovill took Heard's patent; and, according to the extent of knowledge then existing, hydrated oxide of iron would purify gas. According to the state of knowledge, he also proved that by Mr. Croll's patent anhydrous oxide would purify gas, so that his argument was—that Mr. Hills had really added nothing to the stock of common practical knowledge.

Mr. BOVILL: That was so.

Mr. GROVE: I hope my learned friend will remember that the question is not now before a jury.

Mr. BOVILL: There was a misfortune in the case, that it was before a jury of country gentlemen.

The LORD CHANCELLOR: Whether or not it was a trial before a jury of country gentlemen, although there were nice questions of science, they could only be tried by that tribunal which the law has prescribed.

Mr. BOVILL: There was a ten days trial before a jury in respect to the Electric Telegraph Company, and there is every prospect of that case coming before your lordship.

The LORD CHANCELLOR: Oh, I had that in its infancy as counsel.

Mr. BOVILL resumed. Mr. Croll took hydrated oxide of iron, and used it for the purification of gas, and afterwards used it as anhydrous oxide. It might be convenient for him (Mr. Bovill) there to refer to what Mr. Croll did; but, in respect to legal points in reference to Heard and Croll, and the state of knowledge at the time, it would be for his lordship to determine. The general principle carried out by Heard was, that the oxides of iron might be applied to the purification of gas, and it was impossible for any claim to be set up by Hills as to what had been done by Heard and Croll years before.

Mr. GROVE objected to anything being gone into by his learned friend as to what was done by Croll, as it would be to open the whole case which had been submitted to a jury. The effect of the specification would be admissible, but that was a mere matter of fact for the jury.

The LORD CHANCELLOR said the proposition seemed to be, that the plan was not new. Why was it not new? The answer of Mr. Bovill was the production of Heard's patent; but it would not be sufficient, in his mind, to produce Heard's patent, unless he concurred in two things. The first was, unless he proved that the propositions in Heard's patent were true; and, secondly, unless he proved to him that the statement made by Heard was practical, and capable of application. Heard said that oxide of iron would purify gas; but he could not decide upon that, unless he knew, from extrinsic evidence, that such was the fact. Mr. Croll, in his patent, described a particular process, but he could not decide on that unless he knew that it was a practical one. Mr Bovill had a right to use that evidence, to convey to his (the Lord Chancellor's) mind the state of knowledge at the time, that he might understand technical words, and what they were intended to signify; secondly, as to the truth, in point of fact, of the statements he made; and, thirdly, whether, in reference to the things he had stated, he could come to the practical conclusion, that they were capable of producing the effects he had described. He understood that Mr. Bovill had read portions of the evidence, to show the practical knowledge of Croll. He read statements from a book, to show that Mr. Croll's patent was used, and did produce certain results; which was a legitimate purpose, and would come within the power of the court of appeal, or how could he (the Lord Chancellor) determine whether Hills' patent did or did not add to the stock of human knowledge?

Mr. BOVILL said, his lordship had given an opinion in his favour. He then went on to say that Mr. Croll had done certain things, which his learned friend had contended were nothing but a series of experiments; yet, if Mr. Croll's specification was only for oxide of iron, and he had for a month used hydrated oxide, then the learned judge was bound to tell the jury he was entitled to use it for the purpose of purifying gas.

Mr. GROVE said, there was no necessity to protract this inquiry to an enormous length. He did not object to the reception of evidence to explain the specification; but, to go into what Mr. Croll did, might be a question for the jury, but could not be a question of law.

The LORD CHANCELLOR: How was it left to the jury?

Mr. BOVILL said, it was left to the jury to say whether it was an experiment, which it was not competent for the judge to leave to the jury; and, as a matter of experiment, they had no evidence of that.

The LORD CHANCELLOR said he found that Baron Bramwell had laid down his view of this part of the case in these terms:—

Now, we come to what Mr. Croll said he did. You have heard, and I will not repeat to you, that what Mr. Croll did was of an experimental character merely, and not a matter done. I am now supposing that he has not specified, except so far as it may be the means of communication. And, if you should be of opinion that what Mr. Croll did was not a publication to the world, even though he used the hydrated oxide, then that would not prevent the plaintiff from using his patent.

Mr. BOVILL said, it had no right to have been left to the jury; and, having settled as to the points of law reserved, he would now proceed on points of fact. They had the evidence of Mr. Croll, who was the superintendent of the Chartered Gas Company, that they used the oxides of iron, and the black oxide of manganese, and that it succeeded in the purification of about 20,000 cubic feet a day. He would refer to Mr. Croll's evidence further on this point:—

Baron BRAMWELL: Let me ask you this: I infer that you have been asked a question about your paper at the Civil Engineers for the purpose of suggesting that you were at that time of opinion that your own process had failed—your own process in this patent?

Witness: Yes.

Baron BRAMWELL: I think it right to put it to you directly; it might have failed commercially, because, as you say, another mode was cheaper, but had it failed because it was a practically inoperative mode of cleansing gas?

Witness: Certainly not. If you will allow me, I will state to your lordship the reason. The other part of my patent was the most valuable part, the removal of the ammonia, which Mr. Hills well knows, he having entered into arrangement with me for its use.

Baron BRAMWELL: Unless you desire for your own purpose to explain, you have answered the question I want. You say "my process has not failed, nor did so in 1848." Now, this question if you please; you say here "after the material has been roasted in an oven?"

Witness: Yes.

Baron BRAMWELL: Does that apply to anything open, to anything uncovered particularly?

Witness: It was an open oven. I did it in an open oven as well as on the top of the retort-beds, but the oven was perfectly open, with the rod with which I had stirred it about, and being in an oven, the idea of stirring, necessarily must convey the idea that it was an open oven; at least, that is the impression on my mind.

Baron BRAMWELL: I do not know that I have a right to ask you, but what do you mean by turning "thoroughly red?" You say the material becomes "thoroughly red." How does it become red—red what?

Witness: My idea at that time was, that it was necessary that it should be at a red heat, and not knowing as to oxides of iron, that there were hydrated and anhydrous oxides of iron, I thought it necessary to have it at a red heat to expel the sulphur.

Therefore, it was hydrated oxide that Mr. Croll took; he applied heat to it to get rid of the sulphur; he established that by evidence on it, and it was not controverted by a single soul. He was not aware, that for a single moment, that a single witness would attempt to contradict Mr. Croll in any evidence that was given for him (defendant), or against him, and as to his learned friend saying this case would occupy a considerable time, he could not understand it, as he (Mr. Bovill) was not aware of a single contradiction to the evidence of Mr. Croll. Mr. Croll's experiment having been passed over, he had taken out a patent for his invention, and it was impossible for Mr. Hills to come and take out a patent for what Mr. Croll had done. They had said that it was not a question of law, but had told the jury that it was an experiment. Now, he contended it could not be considered an experiment, if a man had taken out a patent for it. The workmen had seen the process, and Mr. Croll having experimented upon it openly, he had taken out his patent for it, and it would be really monstrous for any person to come forward and say that he should not do that, and go himself and take out another patent for it. If what Mr. Croll had done as an experiment had failed, and had been abandoned, then they might treat it as no publication; but, until that was proved, they could not treat it as an experiment. The learned counsel referred to the case of *Jones v. Strutt*, but in that case he said there was no patent taken out at all. In this case, it had not been abandoned, but the patent had been taken out for it.

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Mr. BOVILL resumed his argument, and said he should proceed to consider the next matter involved in this case, which was Laming's patent, and should call his lordship's attention to the substance of that patent, as well as to the language he used. In approaching the consideration of that patent, he should refer to the state of knowledge existing at the time. Since the trial at Guildford, they had obtained the knowledge of the patent of Heard, which was to be considered as an addition to the information previously given to the public, and known to scientific persons, and also in reference to the information given to the public by Mr. Croll in his specification. The first observation he should make was, that Laming was aware of the state of things, as, throughout his specification, he treated oxide of iron purifying sulphuretted hydrogen from gas as a matter well known. He assumed it, and his patent proceeded on the assumption that oxide of iron would purify gas, and he made no claim to that in his invention; but he did claim it in combination that it would purify gas from ammonia, and incidentally from sulphuretted hydrogen. He treated that as a matter of common knowledge, and, when he (Mr. Bovill) should come to Hills' patent, he should show that he also treated the purification of gas by oxide of iron as a matter that was known, but carefully guarding himself against claiming oxides in the same combination as Laming had secured in his patent. He came to the state of knowledge as to the affinity of oxides of iron for sulphuretted hydrogen, and that those oxides might be so applied, had been published by Heard, and applied to the purification of gas. The general principle was well known that it might be applied to the purification of gas, and he would draw his lordship's attention to the points not of similarity but of identity in the plans for the purification of gas. He should submit, as a matter of law—the facts were already before his lordship—that Mr. Laming's patent was taken out in 1847, in which he said:—

> Another part of my invention is an improvement or improvements in the manner of using of chloride of calcium for the purification of coal-gas.

He said it was an improvement in the manner of using chloride of calcium, and he went on to say:—

> I do not claim the use of that re-agent in a dry state, nor when it is in a fluid condition; both these ways are attended with inconvenience; in the one case, fluids cause objectionable pressure on the retorts, and, in the other case, dry chloride of calcium dessicates the gas, and thereby causes it to deposit naphthaline.

But he goes on to say:—

> I do claim the use of chloride of calcium prepared in this way—that is, mixing powdered chloride with sawdust, and sprinkling the mixture with water until it becomes damp or wet, or, which is still better, by causing a strong solution of the chloride in water to be absorbed in dry sawdust, or other convenient matter, in such proportions as to confer upon the mass the form of a wet and granulated powder. I claim also the use of the muriate and sulphate of magnesia, iron, and zinc.

And he also says, that "chloride of calcium is both abundant and cheap," and that it may be desirable to make it by "decomposing muriate of manganese, iron, or zinc, by means of lime or chalk;" and he claimed the mixture so made for the purification of coal-gas. [The learned counsel then read some further extracts from the specification.]

The LORD CHANCELLOR said, he did not claim the exclusive use of oxides, but a combination of oxide of iron and chloride of calcium absorbed in sawdust.

Mr. BOVILL continued, and said that Mr. Laming knew that oxide of iron had been patented by Heard, and improved on by Croll. He knew well also that oxide of iron had an affinity for sulphuretted hydrogen. He knew that Heard had stated it; and, knowing also that Croll had published it to the world, he did not claim the oxide of iron, but confined his claim to a combination of oxide of iron and chloride of calcium.

The LORD CHANCELLOR: It seems open to the same observation that the oxide of iron was to be used in its generic state.

Mr. BOVILL said, Mr. Laming had published to the world the mode of making oxides of iron; and he also told the world that, if they would apply them to the purification of gas, they would get rid of the sulphuretted hydrogen. He told the world to use precipitated oxide of iron, and how to use it. Mr. Laming mentioned what was to be done, and what might be done; but Mr. Hills, the next day, puts it into different language, and uses the same thing. He proceeded on the common knowledge as to chloride of calcium, and how it acted on ammonia. Dr. Miller was asked upon it this question—"Is chloride of calcium a matter that is introduced for the purpose of purifying it from ammonia?" and his answer was—"It is." He would also refer to the evidence of Mr. Redwood, who concurred in that opinion. Dr. Miller was asked—"If you use the mixture of Mr. Laming, would not the oxide of iron act upon the sulphuretted hydrogen, and the chloride of calcium upon the ammonia?" and his answer was—"It would be a purifier." It was said that, although Laming's patent destroyed sulphuretted hydrogen and ammonia by the chloride of calcium, and stated the mode in which they might get rid of the sulphur, it did not state in the specification the way in which it was to be done. His answer was, that it did show on the face of the specification the mode in which the sulphur was to be got rid of, and that mode was by hydrated or precipitated oxide of iron. He told the public, "Here is a mode of getting rid of sulphuretted hydrogen by a mixture of chloride of calcium, and the ammonia you may get rid of by oxide of iron." If he showed that, there was an end of Hills' patent. He said to a chemist, that he knew the oxides of iron were patented separately, and that he did not claim them separately, but he did claim the use of them in combination. He told the world how they might get rid of sulphuretted hydrogen and ammonia from gas by a combination of oxides named in his specification. He told the world, and he specified the particular oxides to be used, and they were hydrated or precipitated oxides of iron. He should be prepared to show that he not only stated the oxides generally, but the particular oxides, and the mode of preparing them; and he also told the world that hydrated oxide was identically the same substance used by Laming as used by Hills, and pointed out the mode of preparing it from the same identical materials as Hills mentioned and used. He told the world to use muriates of iron and lime, and Hills told them to use the same things. The learned counsel then referred to the case of *Tetley v. Easton* (2nd C. B. R., pp. 739-40) in illustration of his argument. Applying the language of that case, it was clear that Mr. Hills knew of Laming's patent, and there was no doubt that he had it before him when he drew his specification. It seemed that Mr. Laming obtained a perfect combination without his understanding it, but the effect of it had been to produce a great improvement. He would suppose that, if a person was a good mechanic, and were to see in an article that he could make an improvement, he could not take a part of that, and use it, without infringing the patent of another. That, of late years, was not denied, for, having undergone considerable discussion in a court of law, it was now settled by the judges in Westminster Hall, that a part of a patented machine was not to be taken if that part was new, as that would be an infringement of the patent. That was reported in Ellis and Blackburn, p. 1004. To assume that hydrated oxide had not been used, and that it was now, they must pass over all that was done by Heard and Laming. Laming claimed a particular combination—the freeing gas from sulphuretted hydrogen and ammonia; and he claimed for chloride of calcium and hydrated oxide of iron—not separately, but when in combination. If scientific chemists were to say they did not care about the chloride of calcium, but would use the muriate of iron for purifying gas, that would be taking an important part of the combination of Laming's patent. On that principle, it was not for persons, after Laming had patented his invention, to use any material part of his combination, unless it could be proved to be old. That was the case with Mr. Hills, for, although he claimed certain oxides for purification of gas, he had no right to do so, because they were old, and had been given to the world before. If he could add something that was new, he could claim that; but he could not claim what had been already given to the world by Mr. Laming. He said what three oxides would do, and, if it was possible, Mr. Hills might find out three new ones, and he could patent them; but he could not patent that which Mr. Laming had before published to the world. Mr. Laming went beyond the general oxides, for he used the term hydrated precipitated oxide, and it was quite sufficient that he claimed some hydrated oxides; but Mr. Hills claimed them all. He had described the same oxides as Mr. Hills had described; he used and claimed the same precipitated oxide, and prepared from the same identical materials. They might obtain oxide of iron from different materials, but he should show that these oxides were prepared from the same materials, for the same purpose, and produced the same results. In 1847, Mr. Laming told the world that a certain matter would produce oxide of iron, and that it might be used for the purification of gas; and Laming, having found that out and stated it to the world, and after he had taken out his patent, Mr. Hills brought an action for that which had already been given to the public by Mr. Laming. The learned counsel, having referred to some authorities, said, with his lordship's permission, he would point out that Laming used the hydrated precipitated oxide of iron—that was, the produce of the same materials, and for the purpose of producing the same results as Mr. Hills. Mr. Baron Bramwell asked some questions of Mr. L. Thompson upon this point:—

> Baron BRAMWELL: You say this chloride of calcium, as we know by this time, is the muriate of lime?
> *Witness:* It is the same thing.
> Baron BRAMWELL: And it purifies the gas from its ammonia?
> *Witness:* From carbonate of ammonia.
> Baron BRAMWELL: I believe, if you were to precipitate it with sulphate of iron, instead of muriate of iron and lime, you would get sulphuret of lime?
> *Witness:* You would get sulphate of lime.
> Baron BRAMWELL: Will that purify from ammonia?
> *Witness:* Exactly in the same way.

That was not disputed; and, if they took muriate of iron and mixed it with lime, it would throw down the oxide of iron; and, if mixed with the chloride of calcium, it would produce chloride of lime. He told them that if they took his oxide, or the mixture prepared in the way described, it would increase the purifying power, and that oxide of iron might be obtained from very economical substances; and, where there were great quantities of iron, that they might get it for next to nothing. That it was not alone to be obtained in a natural state—and this was addressed to chemists, who would understand what oxide was to be employed; as it was known as far back as 1806, by Heard, what oxide of iron was to be applied—and had an affinity to sulphuretted hydrogen. He would now come to Hills' specification.

The LORD CHANCELLOR: How cloudy these specifications are! Are they made purposely so?

Mr. BOVILL said that Mr. Hills was in a difficulty, as he had Heard's, Laming's, and Croll's patents before him, and he endeavoured to steer clear of them all. He claimed the invention of purifying coal-gas from sulphuretted hydrogen by precipitated oxide of iron, from whatever source obtained, and used alone, or mixed with sulphate of iron or sulphate of lime. He had not succeeded in avoiding the patents of Laming and Croll; and, although he might be in a position to use one, he could succeed in using it without a licence. He claimed all oxides, from whatever source obtained—he claimed all hydrated and precipitated oxides, which had been obtained before by Laming. He said, in his specification:—

> I claim the hydrated or precipitated oxides of iron, either by themselves, or, which is much better, made into a porous material, by being absorbed into or mixed with sawdust, or breeze, or peat charcoal in coarse powder, or other porous or absorbent material, so as to be readily permeable by the gas, and either used alone, or mixed with sulphate of lime, or muriate of magnesia, potash, or soda, or in conjunction with any other purifying material at present in use for a similar purpose.

He went on to say:—

> Hydrated or precipitated oxides of iron may be conveniently prepared for these purposes by decomposing sulphate or muriate of iron with hydrosulphuret of ammonia, or with lime, magnesia, potash or soda. They may then be absorbed into or mixed with sawdust, peat, charcoal, or breeze, or other material, and afterwards exposed to the air.

The LORD CHANCELLOR remarked that he did not claim hydrated oxide of iron by itself, but he claimed it in combination; while Mr. Hills did not claim it in combination, but as a solitary agent.

Mr. BOVILL said, the difficulty in which Mr. Hills had placed himself was this:—Instead of having confined himself to a particular combination of oxides, he boldly says, "I will claim all oxides of iron." He ought to have done what Mr. Laming had done, who knew what had been done, and guarded himself against it. Mr. Laming told the world that he used muriate of iron and lime; and, to decompose them, and throw down a precipitate, he used oxide of iron. And he would suppose that a man might add a crank or lever to a machine; he might claim them in combination, and not separately. He could not do that; but Mr. Hills claimed the use of all hydrated oxides of iron, from whatever source obtained.

The LORD CHANCELLOR remarked, that he said he wanted a mixture that was a complete purifier, that he could make a mixture of muriate of iron with lime, which should give him two distinct agents with which he could saturate sawdust, and thus obtain what he desired. Mr. Hills said, if they took one of the agents and applied it to sawdust in the manner described, it would effect that object, and he claimed, in reference to it, the things not mentioned in Laming's specification.

Mr. BOVILL said, that Mr. Laming treated these matters, as well known, separately, and only claimed hydrated or precipitated oxides of iron in combination. He would suppose that Mr. Laming had taken muriate of iron and lime, and found that it could be used for the purification of gas, what would be thought of it, if next day a man were to say, "I found out how it acts, and I will take out a patent for it?" As to what other persons had said as to oxides of iron having an affinity to sulphuretted hydrogen, he assumed, after what had been done publicly for five years, using it in the

yard where everybody could see what he was doing, that no person could say, "I claim that material as my invention, whether that material is produced from any source whatever," that source having been in use for five years.

The LORD CHANCELLOR said, he did not agree in the view taken by the Lord Chief Baron that both might exist together.

Mr. BOVILL said, Mr. Hills claimed the use of all oxides of iron, and if any person should even mix muriate of iron with, say grass, or salt water, in such a case, would Mr. Hills challenge that as his patent for the purpose of getting rid of sulphuretted hydrogen? Mr. Laming had gone on producing his hydrated oxide of iron, and, if Mr. Hills' patent was a good one, it would stop him because it was in his patent. He then came to the matters which were identical in the two patents, to see what was done before; and then they would see if Hills did not claim the same thing. Mr. Laming in his specification said:—

To obtain these carbonates in an economical manner, I throw down from ammoniacal or gas liquor obtained in making coal-gas, and previously distilled or not, the sulphur which it contains, and having drawn off the clear liquid, I next precipitate its carbonic acid, or instead of making two separate precipitations, I throw down a mixed sulphuret, and carbonate of the precipitant or precipitants. I prefer to precipitate by means of a muriate or sulphate of manganese, iron, zinc, or lead; I do not claim either of these ways of obtaining a metallic carbonate, but I claim the use of the carbonates above named, however, obtained for the purification of coal-gas.

That was Mr. Laming's patent, but it only required the name of Mr. Hills to make the identity complete, for in his patent he said:—

Hydrated or precipitated oxides of iron may be conveniently prepared for these purposes by decomposing sulphate or muriate of iron with hydrosulphuret of ammonia, or with lime, magnesia, potash, or soda; they may then be absorbed into or mixed with sawdust, peat, charcoal, or breeze, or other such material, and afterwards exposed to the air.

If his lordship would refer to the evidence, he would find also that it was identical with what Croll had done.

The LORD CHANCELLOR: It appears that Mr. Hills claims all oxides, from whatever source obtained.

Mr. BOVILL said, there were three modes from which other people had obtained oxides of iron, but Mr. Hills had claimed them all. One precipitated gas-liquor—Mr. Croll did it, Mr. Laming did it, and Mr. Hills merely altered the term, and did it by precipitated or hydrated oxide of iron. Mr. Croll threw it down by hydrated oxide, while Mr. Laming pointed out a variety of other modes by making what were called carbonates of iron, and carbonate of iron became oxide of iron by exposure to air, but all agreed that carbonated iron was hydrated oxide.

Mr. GROVE said that point had been given up, and he was surprised at his learned friend having referred to it.

The LORD CHANCELLOR: Mr. Laming speaks of carbonate of iron; and that the same substance, on being exposed to the air, became something else; but I must assume it to be carbonate of iron.

Mr BOVILL said that he pursued this question at the trial, although Mr. Baron Bramwell strongly pressed him to give it up, and the last witness that was called he questioned rather strongly about *ferri carb.*, which is the short name for carbonate of iron. As to Mr. Laming's patent, he described the mode of purifying gas by hydrated oxide of iron; and whether carbonate of iron became oxide or not, that was a legal argument, which he could not then go into. He did not think it material to pursue this inquiry, but he protested against his learned friend saying that he had given it up.

The LORD CHANCELLOR: You say that Mr. Laming takes A and B, and Mr Hills takes the whole of that. You say that he cannot legally do that; and now, supposing that you are right in your law, would Mr. Hills be suspended?

Mr. BOVILL said, Mr. Hills would be suspended; and, if he could not use his patent, and it was held to be bad, all that he would have to do, would be what Mr. Laming had done, and that was to make a fresh combination.

The LORD CHANCELLOR said, Mr. Laming, having regard to what had been done, did not claim hydrated oxide, but in combination with chloride of calcium. Mr. Hills was more bold, and treated the hydrated oxide of iron as a new application.

Mr. GROVE said the argument would be that Laming did not know that oxides of iron had been used before,

Mr. BOVILL said, he knew them perfectly well, and, not to make his patent bad, he proposed to use them in combination, but Mr. Hills came and swept the whole of them away. It had been published to the world, and all the world could use it. That opened another question—whether another person could take the same thing, apply it to analogous matters, and claim a patent for it? It was much the same as if a man had used a spoon to eat soup with, and another person were to come forward and say that he would take out a patent for the use of the spoon in eating peas with it. The learned counsel then referred to the case of *Brook v. Aston*, in reference to a patent for the manufacture of woollen, linen, and cotton, reported in the 28th *Law Journal* reports, and also another case reported in the Bench Reports, New Series, in reference to the manufacture of the covers of bottles, which he contended bore upon this question. If hydrated oxide of iron had been applied by Mr. Laming to the purification of gas, it was not competent for a person having that knowledge to come and claim a patent for it: Mr. Laming stated to the world, in clear and distinct terms, that, for the purpose of purifying gas, he decomposed muriate of iron with lime, and that it was useful for the purification of gas. That information was given to the world, and how could a person now come forward and say, "I claim a patent for that mode of purification of gas?" Suppose the question to be one of infringement or not, and that the facts were clearly and indisputably proved, it would be for the jury to determine the facts, and the court to determine the infringement. This was precisely the same question, by endeavouring to destroy one patent, by referring to one which had been previously published, and it would be for the court to decide whether it had or not. The learned counsel here referred to the case of *Seed and Higgins*, 30th vol. *Law Journal* reports (Q. B., 314), as bearing upon this point, being a dispute as to the similarity of two machines for roving cotton. The two machines were before the jury, and Lord Campbell admitted witnesses who swore that they were the same, and others who swore that they were not, and he said it was impossible to withdraw the case from the jury, there being a similitude between the two machines, and that it was a question which savoured more of facts than of law. If they got the facts proved, and there was a common knowledge of the matter, then it was a question for the judge. Now, as Heard had said, that oxides had an affinity to sulphuretted hydrogen, and amongst them oxides of iron, there was that knowledge before the court, and it must be considered in construing these specifications, and how hydrated oxides of iron had been applied to the purification of gas. He then finished what he had to say in reference to Laming's patent. The observations which he had addressed to his lordship discussed the first part of Mr. Hill's patent, which was the purification of gas by hydrated oxide of iron. The next point to which he should address himself was the second part of Mr. Hill's patent, respecting the renovating of materials. Now, it was known before the date of the patent, that oxide of iron would absorb sulphur, but that it might be renovated by exposure to the air. He would place his lordship in possession of the state of knowledge at the time, and would then refer to witnesses on each side to make good his proposition. He would refer first to the evidence of Dr. Odling:—

Mr. BOVILL: Can you say whether the system of renovation or revivification of hydrated oxide of iron, after it is charged with sulphuretted hydrogen, was well known before 1847?

Witness: Well known.

He would then refer his lordship to the evidence of Dr. Taylor upon this question:—

Mr. BOVILL: Before 1840, was it known that hydrated oxide of iron that had absorbed sulphuretted hydrogen, would be restored by exposure to the air?

Witness: It was.

Mr. BOVILL: That is, would be restored to its condition of hydrated oxide of iron?

Witness: Yes.

Mr. BOVILL: Free from sulphur?

Witness: Yes; some little sulphur would be deposited with it.

Mr. Croll in his specification thus refers to this process:—

This material, after it has ceased to absorb the sulphuretted hydrogen, is to be removed from the purifying vessel, and washed in an oven to expel the sulphur which it then contains. After this operation is completed, the material is fit again to be employed by being placed in the purifier moistened with water as in the first instance.

Mr. Croll also gave evidence upon it:—

Mr. WEBSTER: The substance having been so used, did you renovate it afterwards, or heat it afterwards?

Witness: I did.

Mr. WEBSTER: Where was that done?

Witness: It was done on the top of the retort-beds at the Brick Lane Station. We had a large number of retorts set in arches, and upon the top of those arches I placed the material that had purified the gas, for the purpose of obtaining, or as I then thought, of expelling the sulphur. I then used it over and over again.

Mr. Hills spoke of the heating in much the same way as Croll; and the same way was proposed by Mr. Hills in his patent. That was all that was necessary to be said in reference to that matter; but in the case of *Brook v. Aston*, it was distinctly laid down that a man could not take a part of what had been done by some one else, and take out a patent for it. In that state of things, either of the claims of Mr. Hills he contended was bad. Another point to which he wished to call his lordship's attention, was the judgment of the Court of Exchequer, and which was now the subject of appeal. That court said there were certain points of law reserved; but those points were limited without a single fact, and, if he was right, all the reasoning in the Court of Exchequer was bad, especially as Heard's patent was now open to view, and his lordship was now in the position of both judge and jury to determine the facts of the case. His argument disposed of the judgment; and, if his view were to govern the case, the patent of the plaintiff must be held to be bad. In the Court of Exchequer, the matters reserved were as to the meaning of the specification, and whether it meant all hydrates, all precipitates, which seemed to be admitted beyond dispute; and, if so, the patent was bad. Baron Bramwell had dwelt upon this point; and the Attorney-General, in referring to the evidence of Doctor Miller, said:—

What he desires to be understood is, that, as he reads the expressions hydrated or precipitated in the specification, he reads them as synonymous, that the abstract meaning of the word is as he staetd; but, as he reads them in the specification, he reads them as synonymous.

Their argument was, that they might take hydrated oxide, which was natural, or precipitated which was artificial.

The LORD CHANCELLOR remarked, if the words were to be read disjunctively—hydrated or precipitated oxides—would it mean all oxides? and he asked Mr. Bovill to show him from the evidence that that proposition was not true, as it would be most important to do so. In some cases, the words were "hydrated or precipitated," and in others they are "hydrated precipitated."

Mr. BOVILL said, Mr. Hills insisted that all hydrates were his; and, whether they were natural or artificial, he claimed them all. The other points raised were a mere application of hydrated oxide; and with that he should exhaust all the points upon which the rule was sought to be obtained. He should bring forward the parts which were material on both sides of the question; but it was possible that some points might be raised by his learned friends on the other side, and occupy time by setting up imaginary arguments, for the purpose of knocking them down again. He could not tell what points would be raised, but he preferred not to go through the evidence. Having his lorship's sanction, he would leave the case as it stood, as to whether scientific knowledge had been applied to that for which a patent had been previously taken out. The jury were influenced with the belief that oxide of iron had not been previously used; and, as the law would not allow lime to be shot into the river, that became of great importance.

The LORD CHANCELLOR: That would not apply to country gas-works.

Mr. BOVILL said, that "blue billy" was useful for certain purposes; and, in almost all places, that lime sold for more than it originally cost. In conclusion, he ventured to say, that the plaintiff had failed to establish his patent—that it was bad as now claimed, without limitation, and could not be supported.

The Hon. Mr. DENMAN said, after the full and able manner in which Mr. Bovill had argued the case, his lordship would not expect him to follow him through all the details of the case. He had brought before his lordship every single passage of the evidence which bore upon the question, so as to aid his lordship in putting an interpretation upon the patent, and the decision to which he would have to come. Mr. Bovill had referred to those parts of the evidence which were uncontradicted, and, by putting a proper construction upon the various specifications, show that Mr. Hills' patent was not sustainable in law. When his learned friend omitted a passage that bore on the question, he (Mr. Denman) supplied him with it; and there was no one to whom he could refer his lordship as a guide in construing a specification which was no more doubtful than the plainest proposition ever submitted to a court of law. As he referred to the patent, he should show that it would prevent Mr. Hills from claiming this as a new invention. He would make an observation on the point to which Mr. Bovill had called his lordship's attention—whether Mr. Hills' patent included all hydrates, or only those specified? It was right that his lordship should understand how that became material when the case was before the court. It was a curious circumstance that, in looking over the book, his lordship's eye should have alighted on the only passage, in the course of the plaintiff's case, in which any one suggested that the expression "hydrates" did not refer to all oxides of iron. If his lordship would read the Attorney-General's opening, he would find that he had stated that Mr. Hills had made a most valuable

invention, and that, although there were anhydrous and hydrated oxides of iron, it was only hydrated oxide that would purify gas from sulphuretted hydrogen. During the whole of the case, his lordship would find it contended that the plaintiff had patented anhydrous oxide of iron, and not hydrated oxide of iron, and that made his patent bad. The cause came before the Exchequer Chamber, when an answer was put on the construction of the patent, which narrowed the plaintiff's own construction. It was then said that the plaintiff mentioned in his patent anhydrous oxide, such as was produced by precipitated oxide of iron, and that was the only one that would purify.

Mr. GROVE said the question was, whether anhydrous oxide would purify?

The LORD CHANCELLOR said it was proposed to get rid of Heard's and Croll's patent, but that was too general, and the proposition was that the principle was to be discovered in Mr. Hill's patent, as it stated that all hydrates would purify.

Mr. DENMAN said, he would refer to Dr. Miller's evidence on that point:—

Mr. BOVILL: You have been asked about native hydrated oxides being found; and you say there are some which are solid matter. I must ask you whether some of the native hydrated oxides are not found in a state of powder?

Witness: Yes.

Mr. BOVILL: These, I think I understand you, would not purify gas?

Witness: I did not say so; but they do not. There are some native oxides that do.

Therefore, this evidence plainly showed that some native oxides would purify gas, and some would not.

The LORD CHANCELLOR said, in the two instruments spoken of, it was obvious that prepared oxides were referred to.

Mr. BOVILL replied that there was no evidence that natural oxides would not purify.

The LORD CHANCELLOR suggested that it was not necessary for the learned counsel to pursue that point further, unless he was prepared to show by evidence whether all anhydrous oxides would purify.

Mr. DENMAN said, there was no distinction in the patent. He told the world that hydrated oxides were to be used; and, as to precipitated oxides, it would not do to use ambiguous language, but it pointed out plainly to the world that they were to exclude all hydrated oxides that were not precipitated. In one part of the specification, he gave the mode of preparing, and the manner in which it could be used. He said the hydrated oxide of manganese or zinc might be used, but not with the same advantage as oxide of iron. In page 12 of his specification, the words which were used were that hydrated or precipitated oxides might be used in the purification of gas. It was proved that hydrated oxide might be obtained in a natural state, and might also be applied by Mr. Hills in carrying out his patent. As regarded hydrated oxides, according to the evidence, the word "artificial" was sometimes applied by chemists to things found in nature.

The LORD CHANCELLOR: Then, some persons applied a word in an artificial sense which ought to be applied in a natural sense.

Mr. DENMAN said, when he came to look at the whole of these oxides, he found that there was more reference to those things which were found in nature than in the limited sense which the Court of Exchequer had put upon them Mr. Hills said that he had patented all hydrated oxides, in whatever way produced, or from whatever source obtained. Therefore, he included all found in a natural state, and all hydrated, although Mr. Hills, in one place only in his specification, had alluded to precipitated hydrated oxides. What was the meaning of the plaintiff's claim could only be ascertained by a reference to the whole of the patent, and the substance of the matter, for it was not a case wherein a plaintiff entitled to a patent limited its operation to machinery, or anything of the kind. But, so far as his application went, as far as it directed the use of oxides under his patent, it was the most common and known method, in the same way as lime was used before he boldly and openly claimed the use of hydrated oxide of iron, either by itself or in combination, but it should be recollected that oxide of iron had been used for the removal of sulphuretted hydrogen, and that ammonia was removed by other means. The plaintiff claimed the removal of sulphuretted hydrogen by passing it through hydrated oxide of iron. It was said he removed sulphuretted hydrogen by oxides of iron, but was that the substance of his claim: did he claim *simpliciter*, that he removed sulphuretted hydrogen by oxide of iron? No; his claim was much higher, for he said:—

I take the subsulphates, the oxychlorides, or the hydrated or precipitated oxides of iron, either by themselves or mixed with lime, sulphate or muriate of magnesia, baryta, strontia, potash or soda; I absorb them or mix them with sawdust or peat charcoal, in coarse powder, or breeze, or other porous or absorbent material, so as to make a very porous substance easily permeable by the gas.

He claimed in his specification a great many different combinations, in all of which were precipitated or hydrated oxide of iron, and formed a part of the modes for purifying gas from sulphuretted hydrogen or ammonia. It was a perfected plan, and by the use of hydrated or precipitated oxide to take away the smell of sulphuretted hydrogen, and, by other matters mentioned, to take away the ammonia. What he had done was, to claim to take away sulphuretted hydrogen by oxide of iron, ammonia by other things mentioned, but he (Mr. Denman) apprehended that in doing that he evidently patented many of the things which were pointed out as applicable to the purification of gas from sulphuretted hydrogen and ammonia, and doing precisely the same things as were done by others. He said he did not claim the peroxide of iron or manganese which were made to a red heat, because Mr. Croll had patented them; but Mr. Croll had not done anything of the sort. He only patented anhydrous oxide of iron; therefore, hydrated oxide was still open to be patented. According to Mr. Croll's evidence, he stated, that hydrated oxide, after undergoing the process of purification, might be renovated and used over and over again. Now, he contended that, if a man had patented a substance in combination, another man could not take one of the substances alone for a purpose for which the person who originally patented it had used it. Mr. Hills had endeavoured unsuccessfully to get out of the patents of Croll and Laming; but he should show that he had substantially taken portions of the patent, or at least the publication of what had been previously known to the world, if not of the patent itself. In considering Mr. Laming's specification, to which his learned friend Mr. Bovill had already called his lordship's attention, it showed clearly that Mr. Hills had two distinct objects in view, which were: to purify materials, and to purify gas from ammonia and sulphuretted hydrogen by the ingredients mentioned in his patent. In the first place, he did not expressly claim the materials—but that was immaterial, as he told the world so—and the plaintiff did not claim the chloride of calcium, for Mr. Laming had said he did not claim the processes for making the chloride of calcium, but he did claim the application of the mixtures so made to the purification of coal-gas. It was a very remarkable fact that the mixtures so named were, in truth, precipitated oxide of iron, prepared in precisely the same mode as described by Mr. Hills, who, in his patent, said, "Hydrated or precipitated oxides of iron may be conveniently prepared by decomposing sulphate or muriate of iron with hydrosulphuret of ammonia," which was identical with the chloride of calcium; and it would be observed that he went on to claim in combination the very things described before for purifying gas from ammonia, and partly from sulphuretted hydrogen. He had given the mode of obtaining oxide of iron; he showed the result of it is useful for the purification, althought it remained in combination with chloride of calcium, and was a portion of his invention. It appeared to him that, while he said he did not claim the exclusive use of any metallic oxide for the purpose of purifying coal-gas, he showed how it might be done, and, reading that statement with another passage contained in his specification, wherein he said that oxides or carbonates were useful, he did claim the mixture so made.

The LORD CHANCELLOR said he appeared to be little aware of the chemical results described in a subsequent part of his claim. It seemed to show that he knew nothing of the chemical combination.

Mr. DENMAN said, all the patents sought two objects, which were, the purifying gas from sulphuretted hydrogen and from ammonia. Mr. Laming, in his specification, said: "I do not claim the exclusive use of any metallic oxide for purifying coal-gas, but what I do claim is, the combination for that purpose of the oxide of iron with the other purifying matters above indicated; whereby the gas may be perfectly purified from its ammonia and its hydrosulphuric acid, without a succession of purifying vessels." His learned friend said, Mr. Hills took credit for doing the things alone which Mr. Laming preferred to do in combination; but, when he gave the mode of preparing the chloride of calcium, he (Mr. Denman) could not see what advantage there was in doing one thing without the other. Mr. Hills treated the case also in combination, but preferred, in the first place, to take away the ammonia by means of water scrubbers. Therefore, the substance of his patent was the hydrated or precipitated oxide of iron, which he claimed the exclusive use of to take away sulphuretted hydrogen from gas. It was impossible to escape from that position, as to the conclusion to which they must come in respect to his patent. He said he claimed it, whether it did that, or whether it was to take away the ammonia. If he did that, did he not do precisely the same thing as Mr. Laming had done—to purify gas from ammonia and sulphuretted hydrogen? Now, that being the state of things as regarded Mr. Laming, let them look back at Mr. Croll's patent, and they there found a distinct declaration to purify gas from ammonia and also from sulphuretted hydrogen, which was known to exist in it. He said, in the first place, that they might purify gas from ammonia by oxides, by whatever name they might be described. He then gave the processes by which that might be done, showing that one thing was applicable to sulphuretted hydrogen, and another to ammonia. He then went on to state again the mode of his process for extracting the ammonia; he gave the mode of removing the ammonia, and then he showed how the oxide of iron was to be applied.

The LORD CHANCELLOR said, it appeared that many of the oxides were used in powder, the vessel being filled to allow the gas to permeate through the powder.

Mr. DENMAN said, assuming that they had hydrated oxide of iron with Mr. Croll's patent, then Mr. Hills did the same thing; and he put it into the same vessels as were previously used for lime, through which the sulphuretted hydrogen had to pass. It was said that Mr. Croll had patented anhydrous oxide of iron, so that he had not in that anticipated Mr. Hills; but, on that point, he would not go into the controverted parts of the case, only so far as was absolutely necessary for the purpose of explaining it. At the trial, it was said that a red heat was obtained at something like 1000°, but it would expel sulphur at the low heat of 700°; and that would lead his lordship to see what Mr. Croll had done in that respect. He had a right to do it in any way; and what he did was to take the material, exposing it to heat, turning it about sufficiently to roast off the sulphur, but that did not necessarily produce an anhydrous oxide. In truth, it was done at the Liverpool Gas-Works, under Mr. Croll's patent, where the anhydrous oxide was taken, and found to do very well; for, after it had become saturated with sulphuretted hydrogen, it was removed from the purifying vessels, and exposed to the air, when it was found to recover its power, and would operate again. It was not material in other parts of the case to discuss whether Mr. Croll meant hydrated oxide in the first, and anhydrous in the second instance? but, at any rate it did not lie in Mr. Hills' power to patent either hydrated or anhydrous oxide of iron. The hydrated oxide of iron, when placed in the retorts, was worked several times before it required to be renovated at all; and, with that oxide, gas was purified from ammonia and from sulphuretted hydrogen. It was supplied to the public at the rate of 20,000 cubic feet a day, at short intervals, for nine months; it was sold in the ordinary course of trade, and paid for by the public; and that was the case left by the court to the jury, to say—in the teeth of such evidence—whether it was an experimental using of the process of Mr. Croll, or not? If there had been such an unreserved use and sale of it, was it not inconsistent that the question of whether there had been an experimental use of it or not should have been left to the jury? If there had been such a user of it as he had described—that it had entered into commercial use—that it been sold to the public—it did not matter whether Mr. Hills had taken out a patent for it or not. It was supplied to the public for commercial use and the public got the benefit of that invention.

The LORD CHANCELLOR: Whether it was a public or a private speculation, that was the province of the jury, and it was left to them to draw their own conclusions.

Mr. DENMAN said, it was proved to have been taken into commercial use and as such, had no right to have been left to the jury as an experiment. The case of *Carpenter and Smith* (reported in the 9th Meesom and Welsby, page 300) was a strong case upon that point. It was that of a patent for the improvement of locks; and the question was, whether or not there had been any public use of them? The evidence was very small, as to the public use of them. It was proved that one lock had been used on a gate, and that although several dozens of them had been made, they had not been used in this country, but had been sent abroad. In that case, it was not thought fit to take the opinion of the jury, but the court decided that it was not such a user as entitled the user to a patent. Then, there was the case of *Newell and Elliot* (4 Q. B. R., new series, p. 249) which, up to a certain point, was in his learned friend's favour on the other side; but the rest was in favour of him (Mr. Denman). That was the case of the Electric Telegraph cable, in which it was held that a patent could not be taken out until the cable was completed, as it could not be used by the public; but that was not the case with Mr. Croll; his case was that gas under his invention was being supplied to the public. Then, there was the case of *Heath v. Smith*, (3, Ellis and Blackburn, p. 256), in respect to the manufacture of iron. In that case, it was held that, if there had been any public user of the article, it was for the court to say so. The judge in that case did not take the opinion of the jury on it, but he ordered a verdict to be entered for the defendant, as there had been no public use of it. There were two other cases older in which the same principle had been laid down as to a public user, and in no single

instance was it that, whether there was a sufficient user or not, there was a case for a jury. What Mr. Croll had done was done successfully, and the same thing was done elsewhere, and it became the same thing when that was done by others and by himself; as it was a case in which a court of common law should protect a person from any prejudices which might exist in the mind of the jury, and say that Mr. Croll was entitled to the benefit of what he had given to the public.

The LORD CHANCELLOR: In your case, your own witness said what he did was only as an experiment.

Mr. DENMAN: There is a vast difference between an experiment that has failed, and one that has succeeded.

The LORD CHANCELLOR said, pure experiments which might amount to a public user to deprive the experimenter of the benefit of them, would be one of the most unjust things that could be done. He did not wish, then, that more time should be wasted upon that point, but, if Mr. Denman would hand to him two or three cases on that point, he would give them all proper attention.

Mr. DENMAN proceeded to cite some other cases, contending that it was a settled rule of law, and had been so laid down, that a man could not take a part of a combination of a patent, if the part of which he wanted to take was new, without an infringement of the patent. It appeared to him that it was impossible for his learned friends on the other side to escape from the dilemma, that Mr. Laming had not patented that which was new in patenting the combination which embraced precipitate of iron. As to Heard's specification, he apprehended the sense in which he intended to be conveyed the words "such metals as possessed a sufficient affinity to sulphur, such as iron, manganese, or lead," he did not exclude oxides, but that he assumed it to be understood iron and its oxides, manganese and its oxides, and lead and its oxides. That he (Mr. Denman) believed to be the real meaning of the passage, and included such metals as iron, manganese or lead, or the oxides of such metals.

The LORD CHANCELLOR: When you obtain altered language, I shall be with you upon that altered language, but at present you are bolder than your leader (Mr. Bovill) in putting such a construction upon the passage.

Mr. DENMAN contended, that he had put the true construction upon the passage. Having referred to the case of *Betts v. Menzies*, he said he thought thought that he had sufficiently shown his lordship, as regarded Croll's and Laming's specification, that there had been a good and proper publication.

The LORD CHANCELLOR intimated, if Mr. Denman had anything to add to his observations, he could do so on the following morning.

SATURDAY, JAN. 18.

Mr. DENMAN said, in reference to the permission which his lordship had given him last evening to add anything further this morning to his argument that he might desire, he had to say that he did not intend to add anything to it unless his lordship should require him to do so.

The LORD CHANCELLOR: I have considered this, Mr. Grove, and I think I may relieve you from the necessity of addressing yourself to any arguments derived from Heard's patent, and, also, I will relieve you from the necessity of adverting to any arguments founded on the alleged uses by Croll of the invention, by which it has been contended that it became *publici juris*. Therefore, of the points that have been opened, there will remain the arguments derived from Croll's patent, and the arguments derived from Laming's patent.

Mr. GROVE, for the plaintiff, said, in addressing himself to the arguments of his learned friends, he should go into the more substantial parts of the case; and he would venture to submit to his lordship the position in which it then stood, for he was not there to discuss questions that could be discussed before a jury, or to look at the evidence for that purpose. His lordship then sat in the same position as an appeal from a court of error would be, by giving a latitude to look at the uncontradicted evidence on the specification, which would be very obscure without that evidence to explain it. Having ventured to think a concession had been made which could not alter the question—even looking at it by a one-sided view—yet, if his lordship, sitting as a jury, should entertain a contrary opinion, he did not think that they could properly discuss before his lordship those parts of the case that ought properly to be left to the jury. In the case of *Speed v. Anderson*, in the House of Lords, the question in the case was not as his learned friend, Mr. Bovill. had put it. It was not that the facts were admitted, and it was for the court to say whether there was an infringement; but whether, on the facts found on a special case, it was for the court to say that there was evidence to go to a jury. He would not say that a case might not arise, where the facts were admitted, that that might not be a question for the court to consider; but, in the case of *Seed v. Higgins*, evidence was called on both sides—there was evidence to prove the infringement, and evidence was called for the defendant, to rebut that evidence; but Lord Campbell would not allow the evidence for the defendant to be entered, and that for the plaintiff only was entered. The question in the trial before the House of Lords was, had there been any infringement? Taking that to be a clear distinction between points of law and points of fact, he would take the specifications of Croll and Laming, and, explaining them by undisputed evidence, are they such questions as would justify the court in telling the jury that there was no case for them to consider? That the judge should say, "I tell you, in point of law, there is no evidence of novelty in Mr. Hills' patent; and, therefore, I will withdraw it, as there is no evidence for you to consider?"

The LORD CHANCELLOR: Then your proposition is, that I cannot entertain that view, unless you are in a condition to say that there is no evidence to go to a jury.

Mr. GROVE: That is my proposition.

The LORD CHANCELLOR: You say that everything that should be addressed to me should be to prove that there is a want of novelty in the patent. That may be a conclusion as to a fact, which may be derived from two sources. It may be derived from the evidence of fact, or it may be derived from comparison of an antecedent with an after specification. Where a party is in the habit of saying, "I insist on the novelty of my invention A, on account of facts which I will prove by comparing my specification with the specification of B, and will say that they are identical," then the court was in the habit of saying that the facts were for a jury, but the construction of the specification is for the court. The rule of procedure was, as it were, to cut the case in half—half for the jury, and half for the court; and they were now much in that predicament. We have two specifications, and we are asked to enter into the facts, to show that one specification virtually includes the other. There is great embarrassment in starting that question, as it belongs to the jury and to the court; because the premises from which the inference is proposed to be drawn are partly matters of fact and partly matters of law.

Mr. GROVE: There is no substantial difference as to the line of argument.

The LORD CHANCELLOR: But the Court of Exchequer said that the facts were concluded by the verdict of the jury.

Mr. GROVE: Yes, as to the disputed facts, but not as to the undisputed facts, which were removed from the jury. That explanation of the specification relieved the jury. There is no contest as to facts, as many of the points in dispute were taken as admitted or found by the jury. All that was a question of fact was either conceded or found, and then the question was as to the result of the specification, and did it constitute an anterior publication or not?

The LORD CHANCELLOR: We want the aid of facts to construe the specification. Those are matters, and those alone, which should be brought within the area of the present discussion.

Mr. GROVE said, that was precisely so; and he would even go a step further, and say that all the facts which were admitted might be taken to have been found in favour of the plaintiff. Where they were not different, they might be taken as data on which Mr. Hills said his patent had not been anticipated by Croll or Laming's specification. His learned friend, Mr Bovill, had mixed up those two questions in his view of previous specifications, which more particularly applied to Heard's specification, but, after the intimation he had received from his lordship, he would not go further into that. It was called an old specification, dug up from antiquity to prove that it would indicate to the public, and would, if read by competent persons, fairly indicate to them that the process was in anticipation of the patent in this case; and his learned friend had made the assumption, and the contrary was not assumed that, when found, that it might anticipate a patent, and be taken as ah existence of a fact to be added to the common knowledge; but, if the world was not aware of it, although it might be in existence, it might have no legal existence. For this his learned friend has no authority for the contrary, either as to reason or necessity. The consequence would be, that no specification could be drawn, as every patentee must have the gift of omniscience; he must read all the books in the British Museum; and he must be taken to have written in a book all the knowledge that had been given to the world in every year, and had all that knowledge in his mind when he wrote his specification. His learned friend said, that Laming and Croll had written their specifications, knowing what was contained in Heard's, and written with it; but to that principle he (Mr. Grove) must give his decided dissent.

The LORD CHANCELLOR: Dr. Taylor said distinctly that it was known that hydrated oxide of iron would absorb sulphuretted hydrogen, but that it was not known as applied to gas.

Mr. GROVE said he would concede to his learned friend that for which he could find any authorities, and he conceded that the specification should be read with the common knowledge of the day; but he would not consent that he should interpolate that which was not the common knowledge of the day. He contended that that specification should be read according to the common and practical knowledge of the day. As to whether anhydrous oxide would purify gas, the witnesses for the plaintiff said it would do so to some extent, but would not do so efficiently; and, although some portion of the sulphuretted hydrogen might be arrested, it could not be considered as an efficient agent for its purification. The witnesses for the defendant said it would purify equally well with hydrated oxide; but, as that was a point of fact, it must be taken as found for the plaintiff. It was a singular result, if the evidence for the defendant was correct; it was, he said, a most extraordinary thing that, if anhydrous would purify gas as well as hydrated, the defendant, or any one else, did not use anhydrous oxide. There would be an end to litigation about it; and he would pledge himself that Mr. Hills would not interfere with them. Cross licences had been granted to Laming, from Hills, to use hydrated oxide, and from Laming to Hills, to use anhydrous oxide; but Mr. Hills did not want to use anhydrous oxide. Mr. Laming had paid Mr. Hills £500 to be allowed the use of hydrated oxide; but, if anhydrous would purify as well as hydrated, Laming had no necessity whatever to have so unwillingly paid Mr. Hills £500. That was pretty strong evidence that anhydrous oxide was inefficient; and, although the other side might produce a certain amount of purification from it, it was not efficient for a complete purification. He (Mr. Grove) agreed with the witnesses that anhydrous oxide would not purify; and his learned friend had said, in reference to hydrated oxide, that it was common knowledge that anhydrous would not do: but, in another part of his argument, he said that both anhydrous and hydrated oxide would do perfectly well. He said it was in a molecular state, and he agreed with him; but there was nothing new in the discovery that anhydrous oxide was in a particular molecular state, nor were any of the witnesses asked anything on that point. The witnesses for the defendant said that anhydrous oxide, in a certain molecular state, would do.

The LORD CHANCELLOR said that Mr. Bovill had said, at the time of Mr. Croll's patent, it was supposed that hydrated oxide alone would do, and that anhydrous would not do; but that was a mistake, and that, from the time of Mr. Croll's patent, they found anhydrous oxide would do, and that it was proved that hydrated oxide, if subjected to a particular heat, would do so as it became anhydrous.

Mr. GROVE said, that Mr. Bovill had read the evidence of Dr. Taylor, in which he was asked if hydrated oxide of iron would absorb sulphuretted hydrogen? and he said it would. He was then asked if anhydrous oxide would do so? and he replied that it would not. He (Mr. Grove) would now refer to the evidence of Professor Miller upon this point:—

The ATTORNEY-GENERAL: You can answer the question as a chemist. Has your attention been directed to the manufacture of gas?

Witness: To a variety of points in its manufacture for many years.

The ATTORNEY-GENERAL: And you never heard of the oxide hydrated or anhydrous being employed in the purification of gas down to the period of Mr. Hill's patent?

Witness: I had not.

There was also another passage in his evidence upon it:—

Mr. BOVILL: Was it known before 1849 that certain native hydrated oxides would not purify gas?

Witness: I really do not know; my attention was not directed to the subject before that time.

Mr. BOVILL: You do not know whether it was or not?

Witness: I do not know. I should suppose nothing was known about the purification of gas by hydrated oxides before that time.

Mr. BOVILL: Why should you suppose so?

Witness: According to my knowledge, it was not. I state that I do not know of the application of the hydrated peroxide of iron previous to the date of Mr. Croll's patent.

The word "suppose" as used, he contended ought not to be used in the sense that it was now supposed, but that it ought to be taken as "I suppose." The assumption of his learned friend was not correct when he assumed that it was known before 1849 that hydrated oxide of iron would

absorb sulphuretted hydrogen. The question was put in this form—Before 1840, was it known that iron had an affinity for sulphur, whether it was in a metallic or oxide form? It was put in the strongest form—"Was it known before a certain date that hydrated oxide of iron would absorb sulphuretted hydrogen?"

The LORD CHANCELLOR said, if Mr. Grove would bring that clear to his mind, it would confer an advantage. One objection taken by the defendant was referred to in a passage from Berzelius.

Mr. DENMAN said, the passage from Berzelius was read at the trial.

Mr. GROVE said, the passage in Berzelius referred to was on another point.

The LORD CHANCELLOR said, he believed that when the grounds of objection were stated, in moving for a new trial, that the passage from Berzelius was read.

Mr. DENMAN said, at the trial the book was not put in, but it came out incidentally, when Dr. Taylor gave it as his opinion that it had been previously known, and he gave Berzelius as his authority.

Mr. GROVE said, he did not think that the point was worth dwelling upon, but it occurred to him that what Berzelius referred to was iron in a metallic state; and oxide of iron, until recent discoveries, was so spoken of by chemists in old books. It was said that oxides of iron had an affinity, and would absorb sulphuretted hydrogen. There was no question raised as to the different kinds of oxides, or which of them would absorb; it was not a question raised at the trial. Nothing was shown as a negative fact, that, while hydrated oxide had an affinity for sulphur, and would purify sulphuretted hydrogen, that anhydrous oxide would not. It was known to chemists as a fact, that, when oxide of iron was exposed to sulphur or sulphuretted hydrogen, it would combine with the sulphur; but it was not, as Dr. Taylor expressly said, by any means known the effect of oxide of iron on a mixture which was not sulphuretted, but a mixture in which sulphuretted hydrogen formed an infinitesimal part—a small portion of an extremely offensive and noxious gas. Did, he would ask, it follow as a chemical necessity, because it was known that oxide of iron had an affinity, and would take sulphur from sulphuretted hydrogen, that it would take it from coal-gas, in which it formed a very small portion? In coal-gas, there was a large quantity of tarry matter, ammonia, and various other things, but any one of them might prevent the action of the oxide, or so lessen the velocity of its action as to render it totally inefficient for the purification of gas. If they were to take sulphuretted hydrogen with oxide of iron, put it into a bottle, and shake it up, they would find, in a few days, that it was converted into metal; and, where gas was supplied at the rate of 10 or 11 million cubic feet a day, it acted on the ingredients, and used them in a way that nothing but experiments could show. He would now refer to the evidence of Dr. Taylor upon it:—

The ATTORNEY-GENERAL: Will you allow me to ask you, did you ever, until the date of Mr. Hills' patent, read or hear of this substance—of any hydrated oxide of iron, combined with sulphur, being exposed to the atmosphere in order to renovate it, as a step in any process of manufacture?

Witness: I did not, nor is it mentioned in any scientific work that I am acquainted with. As an instance, I have referred to Berzelius.

The ATTORNEY-GENERAL: Nor ever did you know it applied to the purification of gas at all, or anything relating to gas?

Witness: No; the first instance of it, I believe, was in Mr. Hills' patent—that is, as to the profitable application of it.

The ATTORNEY-GENERAL: Besides the combination of hydrated oxide of iron and sawdust, and sulphuretted hydrogen, when the gas is passed through this substance, is there not also a good deal of gaseous matter—impure and thick gaseous matter, or something like thin tar, which forms over it?

Witness: There is.

The ATTORNEY-GENERAL: So that, besides the actual ingredients themselves, the hydrated oxide of iron and sawdust and sulphuretted hydrogen, which has been absorbed, you have tarry gaseous matters which it has acquired during the process of purification?

Witness: Yes.

The ATTORNEY-GENERAL: Without experiment and application in the manufacture of gas, would it follow that, because the sulphuret of iron would lose its sulphur by exposure to the atmosphere, that this combination of substances which I have last mentioned, of hydrated oxide and sawdust and sulphuretted hydrogen, and those gaseous and tarry matters, would likewise lose their sulphur by exposure to the atmosphere?

Witness: No.

Baron BRAMWELL: Stop! I see the importance of that question. Although, as an abstract proposition, sulphuretted hydrogen was known to combine with these things, it was not known that the sulphuretted hydrogen in combination with gaseous and tarry matters would lose its sulphur by exposure to the atmosphere?

Witness: Just so. This spent material contains cyanogen, compounds of ammonia, tarry matter, and other products which the Attorney-General did not mention, which would render it necessary to try special experiments upon the products in order to determine the fact.

The LORD CHANCELLOR said, that was all on the question.

Mr. GROVE said it was. He then went on further to say:—

The ATTORNEY-GENERAL: I will ask you, with regard to Mr. Hills' patent and specification, have you considered the patent and specification, and, to the best of your judgment, knowledge, and experience, is that process both the first of purifying gas, and the second of renovating the substance, entirely new, or was it at the date of the patent?

Witness: It is, in my opinion.

The LORD CHANCELLOR said, no one disputed the application of hydrated oxide; but the question was, was it a new application as applied to gas?

Mr. GROVE said, Mr. Bovill, in the course of his address, had not argued that point.

The LORD CHANCELLOR said, Mr. Bovill had laboured to prove that these specifications should be read by the light and knowledge of the time, and in the atmosphere in which the reader moved and breathed; that it was known that oxide of iron would absorb sulphur; and that, in taking the specification of Heard according to the common knowledge of the time, he held that, in taking oxide of iron, it meant hydrated oxide of iron.

Mr. GROVE said, as regarded anhydrous oxide, he contended that there was no knowledge upon it, and that there had been no distinction taken between oxides of iron, as chemists had not then examined the different molecular states of hydrated and anhydrous oxides; and whether one, both, or neither would purify gas, was a perfect blank until Croll took out his patent.

The LORD CHANCELLOR: How can you say that, having reference to Heard's patent?

Mr. GROVE said that Heard went no further than Berzelius, because lime was then used; and he said that he passed the gas over heated lime.

The LORD CHANCELLOR said, he had relieved him from Heard's patent, which it was said, in speaking of oxide of iron, might be taken to mean both hydrated and anhydrous; and, if so, that was, in point of fact, a truthful information.

Mr. GROVE said, he should follow that in the course of his argument.

The LORD CHANCELLOR: But you are labouring to prove that anhydrous oxide will not absorb sulphur.

Mr. GROVE said, he was sorry if he had been misunderstood, but his object was to meet the assertion of his learned friend that there was nothing new in Hills' patent. He should show two things—that Heard's patent was general, and in the expressions of his patent he conveyed no knowledge on which the public could act. They did not read specifications as they would read a special plea, but they read specifications to see what information the public could derive from them.

The LORD CHANCELLOR: That was the point taken by Mr. Bovill, who said that the specification should be read as a printed book, and with the knowledge that existed at the time.

Mr. GROVE said that Mr. Bovill assumed that it was common knowledge that hydrated oxide of iron would do, and that anhydrous would not do.

The LORD CHANCELLOR: Suppose Mr. Bovill to be in a condition to show that in the year 1806 hydrated oxide was known only to exist, and anhydrous oxide was undiscovered until 1849; and, supposing Heard's patent to be read according to the existing state of things at the time, and that oxides of iron indicated an extrinsic thing, would there be anything to answer that description except hydrated oxide?

Mr. GROVE said, he gathered from Dr. Taylor's evidence in the book, that hydrated oxide would expel sulphur; and it was said that Heard had pointed out that all oxides would purify sulphuretted hydrogen; but, it might be said that Heard really knew nothing about it, as he had hitherto treated it with lime; and, when he came to other things, he gave a number of chemical agents, which, he said, had an affinity for sulphur, and would produce certain results. He told the public that certain oxides would do certain things; but he did not tell them more than had been told them by Berzelius. As to copper, he mentioned that amongst other things; but no one ever supposed that that was to be employed in the purification of gas. In his mind, he always adhered to lime, in substance, in a dry or damp state, or such metals, or their oxides, as possessed a sufficiently strong affinity to sulphur as would answer the purpose, such as iron, lead, manganese, or copper, as would tend, in a lesser or greater degree, to remove sulphuretted hydrogen from gas. If that was to be considered as an anticipation of Mr. Hills' patent, Heard claimed every discovery, every substance known at the time, as having an affinity to sulphur.

The LORD CHANCELLOR: I cannot agree with you that no knowledge of the purification of gas, by the use of oxide of iron, is derivable from this specification. Is there not a difference of opinion that no information is given to the public by this specification?

Mr. GROVE said, the specification might be some information to the public, and he (Mr. Grove) had no doubt that Heard, at the time, wished to throw his net as wide as possible; but the question was, did Heard, at that time, indicate to the public how they might purify gas? He (Mr. Grove), on the part of Mr. Hills, declared that a distinction was known between hydrated and anhydrous oxide before Mr. Hills' patent; but he was the first person who discovered that precipitated oxide of iron would be an efficient agent for the purification of gas. There was a great deal of evidence upon this; amongst it was that of Mr. Campbell, who stated that it was not a fact that there was any common or general knowledge that hydrated oxide would absorb sulphuretted hydrogen, and far less was it applicable to coal-gas. It was not known that it would absorb sulphuretted hydrogen as it existed in coal-gas; and not a particle of evidence has been given that, up to Mr. Hills' patent, any one knew that hydrated oxide was an efficient agent for the purification of coal-gas.

The LORD CHANCELLOR: The witness, I think, said amongst chemists, it was not well known.

Mr. GROVE said, he would read his evidence on that point:—

Mr. BOVILL: I want to call your attention to this: was it not perfectly well known to chemists that hydrated oxide of iron would absorb sulphuretted hydrogen?

Witness: It was known to chemists that hydrated oxide of iron would absorb sulphuretted hydrogen. It might be known as an experiment in the laboratory.

Mr. BOVILL: I ask you, was it not a fact, well known to chemists?

Witness: No; it was not a fact well known to chemists.

Mr. BOVILL: Was it not well known in laboratories amongst chemists?

Witness: No; I am not aware that it was.

Mr. BOVILL: Did you know it would?

Witness: Well, I do not know that I did until it was pointed out to me by this invention of Mr. Hills.

Mr. BOVILL: What did you mean by saying it was well known just now?

Witness: It was known.

Mr. BOVILL: Did you not say it was generally known?

Witness: It was known; it was not known to myself; at least, I had not had my attention called to it.

The Lord CHANCELLOR said this witness spoke very fairly, as he began by stating that it was known. Counsel in his ingenuity wished to get from him whether it was generally known; but, the witness said he could not say that it was generally known, and he admitted that it was not known to himself until his attention was called to it by this patent.

Mr. GROVE would ask them if that knowledge, modified as it was, was to take away from Mr. Hills the credit of his invention by the patent of Croll, which was substantially the purification of gas by a roasted anhydrous oxide? He would not contend or go further than that, and Mr. Croll must admit that the mode in which he so treated gas was the very essence of his patent, and so Mr. Bovill had treated it. He said it was part of the knowledge given to mankind, that hydrated oxide of iron was efficient for the purification of gas, and yet with this knowledge he only patented a part of it. He assumed to apply heated oxides, but manganese seemed to be the uppermost in his mind. The onus lay on the party who said he had anticipated a discovery, to show collateral matters were such that they must lead to the deprivation of credit of the subsequent man, as it was well known that there were a number of men who were what were known as obstructive patentees, who did not wish to get on themselves, and give the public the benefit of new inventions, but to keep other people back. With his (Mr. Grove's) small smattering of chemistry—with the small knowledge he had of it—he could anticipate a number of patents; and, although he might at random make five or six statements which might be wrong, yet, in time, one of them might become true. He had no doubt that his lordship had read the history of the inventions of Roger Bacon, and, although not one of them was made in his time, yet some of them had come true. He spoke of carriages going without horses, and going over mountains by the wind; and he talked of them as facts which might be done, and they had seen them done. Then, he talked of flying with wings, and the time may come when that might become true, as there were many things which were spoken of in Roger Bacon's time that appeared to be very extravagant, yet some of them had come true. And so it was with patents, and, although there was no definite application of the patent at the time, yet it was possible that some of them might become true. In Mr. Croll's patent, at the 4th page of his specification, he thus describes his process:—

The third part of my improvements in the manufacturing of coal-gas consists in the application of the black oxide of manganese to remove or free coal-gas of sulphuretted hydrogen, which is accomplished in the following manner:—After the gas

has been freed from ammonia, as above described, it is then to be passed through a vessel similar to those now in use for the purification of coal-gas by what is denominated dry lime, and charged in a similar manner with black oxide of manganese in powder moistened with water to about the same consistency. The period required for each charge is to be ascertained and regulated by the same tests as if dry lime were used, and which is well understood; in short, requiring no further alterations except in the materials I employ for the absorption of the sulphuretted hydrogen. This material, after it has ceased to absorb the sulphuretted hydrogen, is to be removed from the purifying vessel, and roasted in an oven, to expel the sulphur which it then contains. After this material has become thoroughly red in the oven, I have found from two to three hours further time to be sufficient to accomplish this object—taking care that, whilst it is being roasted, it be well stirred in the oven.

It would be seen that the object of his patent was primarily directed to manganese to be exposed to a red heat, to burn off the sulphur, and it was that alone that could make his patent valuable; for, if manganese were to be used but once, and then thrown away, it would be too expensive: and that led to his notion of renovation. He went on to say that he employed an open oven, exposed to air; and that he made a point that his oven should be frequently open.

The LORD CHANCELLOR said, Mr. Bovill had contended that was most important, as it was exposed to the air.

Mr. GROVE said, he took issue with him upon that point. He used the oxide of iron in the most general way, believing that oxides of iron had an affinity for sulphur; but there was not a particle of evidence as to what sulphate of zinc would do: all of which he should show when he came to Laming's patent. It was obvious, his great reliance was as to the mode of treatment.

The LORD CHANCELLOR said, that, when the oxide had no longer power to absorb, he restored it by the action of heat, but not in the first instance, when put into the vessels.

Mr. GROVE observed, if they were to say that it would not be so efficient in the first state as in the second, according to chemical knowledge, it would not do to interpolate it for one purpose, and not for the other.

The LORD CHANCELLOR remarked, that Mr. Bovill had said, that all specifications were intelligible only to those who possessed some knowledge upon the subject: not a knowledge of a high degree of education, but a knowledge for the practical application by persons to understand that the specification meant hydrated oxide of iron. He asked the learned gentleman to consider the words read, and taken with reference to extrinsic objects, which at a particular time they were supposed to denote, and then to see the force of the argument which had been presented to him. He would here refer to Lady Hewley's case, which rested on the interpretation of the word "godly;" and, on reference to the state of things at a particular date, when the will was made, it was found that the word "godly" was understood to mean a particular sect of Christians, and so it was held. That was the argument of Mr. Bovill, who said, at a particular time, and in the state of information at the time, that the words of the specification pointed to hydrated oxides; and that at the time it was not deemed necessary to introduce the adjective "hydrated," as all would understand that it spoke of a particular thing, which would answer a particular purpose, and that was hydrated oxide.

Mr. GROVE said, he would not construe a specification by the knowledge contained in the books of the British Museum, but the general knowledge amongst gas chemists; but he wished now to direct his lordship's attention to Mr. Croll's specification, and throughout it would be found that manganese was valuable, for, after it ceased to absorb the sulphuretted hydrogen, by submitting it to a red heat, it could then be used again. He did not say what oxide of iron he would select, or how he would select it, but he spoke of manganese, and said, after it had ceased to absorb the sulphuretted hydrogen, they could burn it, get rid of the sulphur, and so use it again. The first thing that was present to Mr. Croll's mind was evidently anhydrous oxide of iron, and he used it in the first instance. He said generally oxide of iron, at the time he wrote the specification, as he knew nothing of any distinction between hydrated and anhydrous, or native or artificial oxides or peroxides. If the specification was read at the hills in Wales, which contain a large quantity of oxide of iron, and it was said that oxides of iron would purify gas, a person might say, here is a large quantity of oxide of iron, and it will purify gas, but that person would find that it would fail. Some native oxides would not do; but a person reading Mr. Croll's specification might suppose he had made a capital discovery, and say oxide of iron is dear where Mr. Croll lives, but here I have got it for nothing. He sets to work, and he fails, and, having made the experiment, he does not know the cause of his failure. If a man relied upon books for his experiments, he might fail time after time, unless the writer explained some little matter, which, if it had been known in the first instance, would have saved him time, trouble, and money

The LORD CHANCELLOR said, he would give as an illustration of that, and would take the common medicine known as James's powders, and, if any person was to try to make it, he would entirely fail, not knowing the proper proportions of the ingredients.

Mr. GROVE said, a man might take Mr. Croll's specification, and make experiments, and might fail, and Mr. Croll might be unable to tell him why he failed—like the loss of the planet Neptune, which was lost for centuries for want of the right knowledge where to look for it. Another man might come and say—"You failed, although you employed oxides of iron, because you did not know of one class of oxides of iron—namely, hydrated or precipitated oxides. You took anhydrous or native oxides; they would not do, and you might have failed, had you gone on for years. I have found out that I should take precipitated oxide, and, if you had used it in your gasometer, it would then have been to you a valuable, and not a worthless property." The object of the patent law was for the encouragement of industry, to enable the inventor to bestow his time, and to induce capitalists to bestow money, with the hope of the reward that would flow from the improvement in manufactures. Such inventions would never be productive—the public would never get the benefit of them, if persons, when they risked the expenditure of time, or money, or both, did not reap the encouragement of a reward, either from the Government, or from the product of the invention; and that could only be ascertained by the employment of capital and labour; but that labour and capital would not be employed, if there was to be no patent. He said, in case the public had read and acted on Mr. Croll's specification, they might have vested hundreds of pounds, and received no benefit; and, therefore, he contended that Mr. Hills' patent was entitled to that reward. Did Mr. Croll's specification give such an assurance? It did not; and here he might put the case of a man who took oxide of iron to try an experiment, and he failed—he got no instruction, and he wasted a good deal of money. He goes to a chemist, and all he says is to ask him how he could think of wasting his money in such a way? But, in the case of Mr. Hills, if they used his specification in the way he stated, it was perfect, and they would be certain of the results. If Mr. Croll were asked, he would say that anhydrous oxide would succeed; but he did not say anything about hydrated. He might be told that he should have tried hydrated oxide in the first instance, and that it would become anhydrous; but he fails, and goes on failing; and, therefore, he would ask, was the subsequent discoverer to have no credit for the discoveries he had made? As to the publication of other specifications, the question to be put to the jury was, did the specification put the public in possession of the invention without experiments on the subject, or did it fairly put the public in possession of the invention, so that if a man were to go and make experiments with the book in his hand, it must be his own fault if he did not succeed? [The learned counsel here read from the judgment of Baron Bramwell on this point, and then quoted the case of *Morewood v. Rogers*, which was in respect to galvanizing iron by plunging blocks of heated iron into zinc.] So far, the invention was not new, but it turned out that it required a great deal of labour to bring it to a certain result, to fit it for practical use, and in that case the jury found it to be a new discovery, and that verdict had not been disturbed. He would ask them, would it not be contrary to common justice if a specification was not something that would put the public in possession of information to lead to certain results? The patentee showed that his invention differed from other things that had preceded him; but for the purposes of publication did the specification put the public fairly in possession of the invention? Did Mr. Croll's specification do that? He (Mr. Grove) submitted that it did not. He submitted that it did not put the public in possession of Mr. Croll's far-fetched ideas, and, but for Mr. Hills' discovery, the public might have remained in ignorance for a hundred years for anything they would have derived from Mr. Croll's patent. He ventured further to submit to his lordship that Mr. Croll's patent dealt principally with manganese. He would refer to the evidence of Mr. Campbell:—

Mr. BOVILL: Will you pledge your reputation that black oxide of manganese is not hydrated?

Witness: I will pledge my reputation that black oxide of manganese, as it is understood, is anhydrous.

The LORD CHANCELLOR asked, if that term was so understood?

Mr. GROVE assented. He would now come to Mr. Laming's patent, and he would say, that there was one matter in it, which his learned friend did not advert to, but which throws some light upon it, and which he should touch upon in the course of the argument, he should venture to submit to his lordship, and he believed that in reading the document that his mind would not receive the same impression, or would he place the same meaning on the words as had been placed on them by the other side; and, when his lordship saw the substituted words of the specification, with the disclaimer of Mr. Laming, he believed that he would find very adequate reasons for the argument which his learned friend had used.

The LORD CHANCELLOR said, he had made a note of that. He wished to ask Mr. Bovill if he desired the specification, and afterwards the disclaimer altering its meaning as a publication, to be read as the original specification in its integrity.

Mr. BOVILL said, he did as a publication, for, supposing a man took three things, and only claimed the first and second, that would still be a publication to the world.

The LORD CHANCELLOR said, the disclaimer of a part might very materially alter the meaning of what was left, and would not the common inquirer take that which was left?

Mr. BOVILL remarked that the disclaimer did not extend the patent, but, on the contrary, limited its operation.

Mr. GROVE said, he did not disagree with his friend, Mr. Bovill, and he agreed that, although a portion was disclaimed, it might still be looked upon as a question of publication; but the part omitted could not put the public in possession of the thing unless it were to be read by the light of the disclaimer, which might make that clear which was obscure before; and, on the other hand, it might be that the part of the document disclaimed made clear that which, before it was disclaimed, did not. He found that Mr. Laming most ingeniously, by his disclaimer, omitted all the substantial parts of his patent, and left only that which, he contended, applied to Mr. Hills' patent. Laming and Evans tried to get a patent for hydrated oxide of iron, but the Attorney-General refused to entertain the application; but, notwithstanding this refusal, Mr. Laming inserted it in his patent, and, upon that, Mr. Hills obtained a *scire facias* against him on that point, and Mr. Laming was compelled to pay Mr. Hills for a licence, in order to enable him to use hydrated oxide of iron. Mr. Laming's knowledge then became an important element as to how his patent was to be read, for it was shown that he did not know that hydrated oxide of iron would purify gas; that he afterwards endeavoured to obtain a patent for himself; that he then submitted to a *scire facias*, and paid Hills for a licence for the use of it. Taking all these together, it must be presumed that he did not know the use of it when he drew his patent. His learned friend said that he had no right to refer to Laming's patent, but he contended that he had that right, when he pursued the question as to what was public knowledge at the time; but that would be made plain on the face of the disclaimer.

Mr. BOVILL said, all this discussion about the disclaimer was in reference to another patent.

Mr. GROVE said that was so.

The LORD CHANCELLOR suggested that, if he thought he had got it already, he would not have applied for another patent.

Mr. GROVE said, he disclaimed carrying out parts of his invention, of great public utility; but, from various causes, it did not appear that he was able to test the utility of some parts of his invention. That would throw a good deal of light on Laming's specification, as he should show when he came to it. He went into a long disclaimer, and, from the passages which he (Mr. Grove) had marked, his lordship would see that he had disclaimed the whole of pages 2 and 3—he disclaimed the whole from line 10 to the end of page 2, the whole of page 3, and page 4 down to line 29, ending with the word "described." Then, it is retained up to the last line of page 5. The whole of page 6 is disclaimed, ending with the words "sulphate of ammonia." Then came the most curious part of his disclaimer, which was the part beginning at line 16, and with the words "another part of my invention." He disclaimed chloride of calcium and metallic chlorides; he disclaimed manganese, zinc, and lead, leaving in only iron, in a prepared state. In the next page, he disclaimed everything down to the word "peroxides."

The LORD CHANCELLOR: It seems to me to be made into the best form for stabbing Hills' patent.

Mr. GROVE said, there was no doubt of it. He then went on to say, "I do not claim for the exclusive use of any metallic acid for purifying gas, but I do claim them in combination."

The LORD CHANCELLOR said, whatever was done ought to be brought into some definite language, and such a disclaimer as that ought never to have been allowed.

Mr. GROVE said, that showed the importance of reading the specification, not by the light of subsequent knowledge, but as Mr. Laming read it when

he made the specification. He claimed the use of chloride of calcium, as it would absorb ammonia instead of using lime; and he gave Mr. Laming credit for other oxides which were useful, but it was more than he deserved. In line 6 of page 12 of his specification, "Chloride of calcium is both abundant and cheap; under certain circumstances it may, however, be desirable to make it for the purposes of gas-purifying by decomposing muriate of iron by means of lime, or of chalk, when the latter will suffice. In such cases, the oxides or carbonates which result are useful for the said purification, and need not be removed." So that it was evident in his mind he deemed chloride of calcium a most efficient agent; but he went on to say that the other carbonates, which were the result, were useful and need not be removed. In that did he at all indicate that hydrated oxide of iron was the most efficient agent for the removal of sulphuretted hydrogen? He supposed that they were to take manganese to get rid of it, or they might take oxide of iron—but what oxide of iron? He did not say hydrated oxide of iron; all about it was a blank, because his mind had not been directed to it, but to chloride of calcium. Then came another passage, wherein he claims the preparations of chloride of calcium, or chloride of calcium and metallic oxide, or chloride of calcium and metallic carbonates, and also of the metallic salts absorbed in solution in sawdust, by adding thereto oxide of manganese, iron, zinc, or lead; but, in his disclaimer, he cut out all that relates to metallic salts, muriate of sulphur or zinc, and retained only the two oxides. In what he uses for the purification of sulphuretted hydrogen, he made no distinction as to the oxide of iron, or the oxide of iron to be added to the muriate of sulphur. He then disclaimed the next paragraph, and he got rid of manganese, although in his specification he said—"The oxide which I prefer is one or other of the oxides of manganese, prepared from the carbonate of that metal by a process of which I claim the practical application." It was important to show that Laming, at the time of his specification, though he did not know the difference between hydrated and anhydrous oxides, did know that lead was found at the bottom of vessels as hydrated oxide. That showed he chemically knew the difference between hydrated and anhydrous oxide; but, although he did know that, he did not know that one was efficient, and that the other was not. How different would be the information given to the public or the manufacturer who read the specification by the light of to-day! He would then read that iron must be used; and there was really a very great difficulty in arguing a case in which everything took a different turn, and a different view was put upon it, and the whole thing was so changed, although the public were ignorant of the fact. He made reference to certain ingredients used, but those ingredients he admitted himself he did not deem to be important. His learned friend had made a point of ammoniacal liquor; but, according to the evidence of Dr. Taylor, the state of knowledge upon it was very different before and after Mr. Hills' patent. He gave his evidence upon that point:—

Mr. Bovill: Does gas-liquor contain a considerable portion of hydrosulphuret of ammonia?
Witness: It does.
Mr. Bovill: Is hydrosulphuret of ammonia a useful agent in connexion with muriate of iron in precipitating hydrated oxide?
Witness: No; I should not select it for that purpose.

Mr. Grove went on to say that he was far from admitting that Mr. Hills' patent was either an alteration or an improvement of the patents of Croll or Laming, but his argument was that he was the first and real discoverer of the patent. If a person patented anything, and another person wished to patent an improvement upon it, he could not do that without the consent of the first man; and so he was at the mercy of the first man, as he could not use it without his licence, and so in turn in the second case. The first man could not get the improvement without the consent or licence of the second man. There was one point which it would not be unimportant to refer to in the disclaimer of Mr. Laming. In page 5, line 19, he said:—

Under certain circumstances, it may be desirable (having reference to chloride of calcium) to make it for the purposes of gas-purifying by decomposing muriate of manganese iron or zinc by means of lime or of chalk, if the latter will suffice.

Now, they had ample evidence that if he used chalk he might use heat, and he might then make anhydrous oxide. Mr. Laming was ignorant of the distinction between hydrated and anhydrous oxide; but he gave the means of producing what they said would produce anhydrous oxide.

Mr. Bovill said, if they used lime combined with iron, it would produce hydrated oxide of iron; if they used chalk, it would produce carbonate of iron.

The Lord Chancellor said he was compelled to rise early on account of public business; but he wished his learned friend to furnish him with some authorities as to rule of law in certain cases.

(To be continued.)

VICE-CHANCELLOR'S COURT.

Monday, Jan. 13, 1862.

(*Before Vice-Chancellor Sir* W. P. Wood.)

BIDDER *v.* RICHARDS (CLERK TO THE LOCAL BOARD OF HEALTH FOR THE TOWN OF CROYDON).

The object of this suit was to restrain the Local Board of Health for Croydon from continuing to discharge sewage, filth, or other offensive or injurious matter, either solid or liquid, into the river Wandle, to the injury of the plaintiff and his property. The plaintiff was the owner of property near Croydon, with gardens and pleasure-grounds running down to the river Wandle, which was originally a clear pure stream, noted for its trout. In 1853, the Local Board of Health constructed a sewer for discharging the drainage of Croydon into the Wandle, at a point between two and three miles above the plaintiff's property. The upper portion of the river was so polluted by the discharge from this sewer that proceedings were taken against the board for creating a nuisance, by a Mr. Lambert. These proceedings resulted in an injunction against the board, and payment by them of £200 to Mr. Lambert for damages. The board, thereupon, constructed a fresh sewer through Beddington Park, for which leave was obtained from the tenant of the park, Mr. Bridges. The river having become polluted and the fish destroyed by this sewer, Mr. Bridges, in March, 1859, obtained an injunction restraining the board from discharging any offensive matters into the river. After this injunction had been granted, the board dug a ditch, the effect of which was to divert the sewage from the Beddington Park channel, and convey it through small tributary channels into the Wandle, where it flows through the plaintiff's property. The sewage, before its discharge into the river, had been deodorized by M'Dougall's disinfecting fluid, but the bill stated that this fluid contained a large quantity of carbolic acid, which was highly injurious to animal life. After the sewage had been mixed with this fluid, it was transmitted through the sewers into tributary channels of the Wandle, or was spread upon the ground and allowed to percolate through the ground, or run off into the river. In December, 1860, the plaintiff first discovered the pollution of the stream, and complained to the Board of Health. The nuisance was for some time diminished, but in May, 1861, it again increased, and legal proceedings were threatened by the plaintiff, and the stream was less perceptibly polluted during June and July. In August, the nuisance was very great, and several dead and dying fish were found in the river. The nuisance from time to time varied very much in extent, but at the beginning of October had again become very serious. Under these circumstances, the plaintiff had filed his bill to restrain the Local Board of Health from discharging the sewage into the river, to the injury of his property. For the defence, it was contended that the particular nuisance complained of as having happened in August last, was occasioned by the accidental discharge of the refuse of the Croydon Gas-Works into the river, for which the Board of Health were in no way responsible, and that the mischief had been greatly exaggerated in the evidence of the plaintiff, while the defendants had done everything in their power to purify and deodorize the sewage before its escape into the river.

Mr. Rolt, Q.C., Mr. Pearson, and Mr. Bidder (of the common law bar), appeared for the plaintiff; and Mr. Giffard, Q.C., with Mr. Miller, represented the defendants.

Tuesday, Jan. 14.

The Vice-Chancellor, this morning, without hearing the reply, which was all that remained of the arguments in the case, delivered the following judgment: I think, Mr. Rolt, you are entitled to have an injunction in this case. The case stands thus:—The Croydon Board of Health, having the duty imposed upon them of draining a very considerable town, containing some 15,000 or 18,000 inhabitants, are desirous of draining it into a small river, whose water is of very considerable purity, used by the riparian proprietors for fishing, and where fish seem formerly to have abounded; the water itself being used for the ordinary purposes for which pure water would be used. The defendants seem to have been desirous, in the first instance, of introducing the sewage in the neighbourhood of other property than the plaintiff's higher up the stream; and, in one, if not in two cases, they were prevented carrying that intention into effect, by the proprietors obtaining an injunction to restrain them from so doing. Then they proceeded to come lower down the river; and, of course, each proprietor in succession would naturally feel anxious as to the steps about to be taken. It appears that, as early as December, 1860, Mr. Bidder complained; and I do not find any dispute that he had then some ground of complaint. However, in the interval between December and May, no doubt a considerable change took place in the arrangements made by the defendants. They not only introduced that material, as to which some question has been raised—M'Dougal's disinfecting fluid—as it appears, to disinfect a portion of what was in their tank, but they seem to have done what was much more effective; they add to the 56 acres which they had acquired in December, of land capable of absorbing partly, and subtracting the particles which are most complained of—organic particles—in the passage of the sewage before it was carried into the river, 200 acres more; so that now they have about 256 acres, as I think it stands upon the evidence, although in some parts it is called 300 acres—but that is not material. That being so, no doubt improvement, to a considerable extent, would result. Complaints, however, were made by Mr. Bidder, in May. He does not seem to have made any in June; but there is some evidence, at all events, that, on the 28th of June, Mr. Hawksley, one of the engineers, inspected the water, and found a quantity of muddy water coming down this channel, which they have now introduced into the river. Now, the water (as we will call it at present) which remains as the result of the sewage after it has passed over these fields, comes in at a point about a mile above Mr. Bidder's property; and, of course, it was incumbent on Mr. Bidder to show actual damage done to him, because it does not follow, as of course, that, although the whole sewage may be seen going into the water a mile above him by some possibility, evils might not be obviated so as not to entitle him to complain. In August, the nuisance became excessive, as it is said by the defendants, from an accidental circumstance. I am not going to determine, at this moment, whether that was an accidental circumstance or not; but I shall assume, on the defendants behalf, that it was an accidental circumstance. At the same time, it must be observed that this accidental circumstance was one of very great annoyance to the plaintiff. The defendants do not seem to raise the question, in the first correspondence, of its being an accidental circumstance, though they did afterwards; and they seem to have been a very long time in stopping that nuisance, which was occasioned, as they say, by the accident of an unlawful interruption of the ordinary process of sewage, by the throwing into the sewer by another company—a gas company—products which by law they were prohibited from sending into the sewage. The result of that accidental circumstance (which I assume it for the present purpose to have been) was, that, undoubtedly, a great number of fish were killed. Whether they were killed above Mr. Bidder's, or immediately by Mr. Bidder's land, I do not think very material, because he is entitled to have the river in such a state that fish can reach him in their ordinary course. It is a damage to him if any proprietor at an upper part of the river chooses to kill or catch all the fish, and it would be a damage of which he would have a right to complain. He made a complaint, and then it is traced distinctly to the defendants works; but they say—"You must go up above our works, and you will find, when you go above our works, that this poisonous material has been thrown in by a stranger; and the effect of that is, that you cannot go against us for an injunction." Perhaps, if the case had rested there, it might have been one to send to law to have that point determined, as to how far these gentlemen would have been answerable, regard being had to their having introduced the sewage into the river, the accident being one over which the plaintiff had no control, which accident he was not subject to at all before the defendants introduced their sewage. Questions would arise upon that which possibly it might have been right to send to law before coming to any conclusion in the particular case before me. I will assume, in the defendants behalf, at present, that this was an accidental circumstance, and that the question is doubtful how far upon that alone Mr. Bidder might be entitled to rely. I assume it, in favour of the defendants, from this circumstance, that Mr. Bidder did not file his bill in August, but in October, when the subsequent complaint arose. Now, in September, grievances were supposed; but, in October, there is very clear and distinct evidence, as it appears to me, which really puts the matter beyond all question. There is no refutation of it; and I will briefly notice how the circumstances stand, which appear to me strongly to corroborate the evidence, before I read the evidence itself. The circumstances seem to me to stand in such a position as to make that evidence in the highest degree probable, if I were entitled, under the circumstances, there being no cross-examination in any way to shake it, and no direct testimony to shake it—

doubt it. There is that *primâ facie* degree of probability which would very strongly confirm my belief that the testimony is honest and correct testimony. Upon the evidence of the defendants themselves, which I am about to refer to, I think I may say, safely, there can be no doubt that, if the sewage is poured in without the precaution of irrigation through the meadows, damage would be done to Mr. Bidder; and it appears to me the defendants acquiesce in that allegation as to damage at an early period. But, then, Mr. Giffard says, we had only 56 acres, whereas we have now 256 acres. It seems to me all but admitted that before that there was damage; and one need hardly say that, pouring the sewage of 16,000 or 17,000 people a mile above a gentleman's property, into a very pure and clear stream, is not a matter which could be well argued as to probable damage; but, I think, upon the evidence before me, it is clearly put beyond argument, because I take Mr. Haywood's affidavit who is a gentleman of experience in these matters, and he says he is in the Sewers Office in Guildhall, and engineer and surveyor to the Commissioners of Sewers for the City of London. Then he details what has been done by the defendants for curing the evil; and he says that, if care and attention be observed in the combined operations of the defendants, no injury will be done to the plaintiff. It leads, therefore, to the strong *primâ facie* inference that, unless care and attention be observed, this gentleman feels himself bound to say evils will result. The care and attention is not that of the defendants, but of a farmer, to whom they have intrusted the work of irrigation, and who, it appears, is to indemnify them if any evil consequences arise from it. Now, how does the evidence stand upon that *primâ facie* case, that, unless care and attention be observed, evils will happen? Bridge speaks positively as to August, and upon that there is no doubt; and he also says that he has carefully examined the water, and finds it destructive to fish. Mr. Giffard's comment upon that is—he does not tell you where. The witness lives on the property of the plaintiff, and, certainly, I am not inclined to accept that comment upon the affidavit of a person who is speaking of his own knowledge, and speaking of the damage which is done to the river, that he must be taken to mean generally, and not anything that affects the plaintiff's interest, when he might have been cross-examined; but not a single question has been asked him. However, he speaks more positively afterwards. He says that the water has become unfit for use. I cannot assume that he purposely goes as near to the sewer as possible to get his water; I must assume that he uses the water in the most convenient way, which would be taking it upon the property where he resides, which is the plaintiff's property. No gentleman who had a pure river through his grounds before, is bound to submit to that pure river water being turned into water which is, as the witness says, "Very offensive, smelling of sewage, and of a brown colour." But, that evidence is strikingly confirmed by the evidence of Monk, because the last witness speaks positively to it as it passes through the plaintiff's property; and Monk happens to be at the spot where the water of the defendants enters the river on the same day. This man, therefore, speaks of having seen the sewer discharging into the river this water of a brown colour, and with an offensive smell. It appears to me, that a plain and distinct case is made there of the sewage having come in by some neglect on the part of the farmer, because I follow the defendants in this: they say you do not bring more recent complaints; you would do so if you could; we have a right to assume that matters go on more smoothly now, and that the water is not now defiled. But, then, you have the evidence in corroboration of Paine and Bickley, two labourers, who speak to the fact distinctly. They are not cross-examined upon it, and nobody has said one word that touches their evidence except this: that one engineer says he has dug up sand which was filthy, and another engineer says he dug up some sand that was not. That may be perfectly consistent; it might happen to be clean in one part, and dirty in another. These labourers gave a minute description of what happened; they speak of the 9th of October, and they are confirmed by Attree. The evidence seems to be very simply told, and there is not any reason for doubting this, which all probabilities would lead one to. They say, when we are at work at times, we know, by a certain filthy appearance of scum, what is going to happen, and, after that appearance, down comes a great rush of foul and offensive matter. That is explained a little more by Attree, the innkeeper, who lives on the spot, who says, at times there is an accumulation of filth from boughs and other things getting before the grating, and that, upon being suddenly removed, down comes this rush. They say it was very bad on the 9th of October. On the same 9th of October, Attree says, "Those who came to my publichouse would say from time to time, 'How that ditch stinks to-night!'" and, upon this particular occasion, he says he was looking with these men, and down came some of this scum; and they said, "You will find you will have more of it presently," and down it came with a rush. Taking the clear evidence of Bridge and Monk that, when it does rush in in that foul state into the river, it gets on to the plaintiff's land, and is unfit for use; and finding, not only on the 5th but on the 9th of October, it did rush down in this filthy state, really I think one is bound to conclude that the same result did take place, although Bridge was not there to test it on the plaintiff's land on the 9th of October. He did observe it on the 5th by his organs of sense, and it would necessarily take place on the 9th. Therefore, it appears to me that there are two plain cases of negligence, which exactly correspond with what Mr. Haywood says. He says, "With due care and attention, you may prevent any nuisance;" and that is all the injunction seeks to do. It is so far a satisfactory case. One feels one is not putting the defendants to any inconvenience. They will do whatever they please, taking care not to annoy the plaintiff. With regard to the argument that was pressed upon me very much—that Bridge ought to have taken up a bottle of water directly he found this foul smell, and that the evidence of the scientific witnesses goes to this: that you cannot satisfactorily ascertain the amount of evil without chemical analysis—I read their evidence only in this way: that there are states, in which nothing is visible to the eye or organs, though you cannot take upon yourself very positively to swear to there being or not being noxious matter in the water without an analysis. But, when your organs do testify to it—that it is both muddy and foul smelling—I think you do not want any analysis; the matter stands proved of itself, and nothing further is required. I say every part of that evidence tallies exactly with what one would have expected from the previous evidence. I do not rely upon the accident in August. I do not make any comment upon that letter which was put in at the last instant, on the part of the engineer of the works, Mr. Fenton; I pass those by wholly; but it seems to me that Bridge, and Monk, and the two bricklayers, and Attree, make out a clear case of fact, of that which everything would lead one *a priori* to anticipate, especially after Mr. Haywood's evidence. Therefore, the proper course is to put the defendants under this injunction, the only effect of which will be to make them take care. I apprehend a very natural course would be to have somebody's eye on that sewer daily—a proper officer, to take care that the water is sufficiently purified by irrigation to prevent the evils complained of. I have to add one circumstance, and that is, the diminution of fish; because really the killing of 24 or 25 fish on a given day is comparatively nothing, but it is sworn to, over and over again, by the plaintiff's witnesses, and not denied as a fact, that, since these works were established, the fish are not one-tenth in number what they were. That is a rude way of estimating, but it is obvious that all the plaintiff's witnesses swear very positively to a great diminution. The defendants witnesses do not meet that, but they say, "It is not only our works, but your have no preserves; the former proprietor did, and another gentleman above does preserve. The *post hoc* may not be the *propter hoc*, but it may not be an insignificant circumstance, coupled with all the other circumstances in the case, that you do find a diminution of fish coincident; and you do find an independent engineer, called by the defendants, saying that, with great care and attention, it will not hurt the river. And then you find four witnesses who speak positively to times when the river was foul. I think, therefore, that the injunction ought to be in the form of the injunction granted by the Master of the Rolls in the other case, which seems to meet this case. The plaintiff must have the costs of the suit.

THURSDAY, JAN. 23.

RE THE SOUTH ESSEX GASLIGHT AND COKE COMPANY.—EX PARTE HULETT.

This case came before the court upon a claim by Mr. Hulett as a creditor against the company, now in course of winding up in chambers.

Mr. Hulett's claim was for a sum of £492. 14s. 4d., £400 of which purported to be secured by two debentures for £200 each, with interest at 5 per cent. given under the hands of three directors and the common seal of the company. These debentures, which had been granted by the company to William Morley Stears, an honorary, but not an ordinary director, in part payment of a large claim against the company for erecting and fitting up certain gas-works at Walthamstow, part of their undertaking, were assigned by Stears to Hulett in the year 1854, in satisfaction of a debt incurred by Stears in carrying out his contract for the gas-works. In November, 1857, Mr. Hulett recovered judgment against the company for an arrear of interest upon the dividends in an action brought by him in the name of Stears. After the order for winding up the company, Mr. Stears claimed to be a creditor of the company for £2000 upon his contract for the erection of the gas-works. The claim was heard by the Vice-Chancellor in July, 1859, and his honour decided that, the contract being for work supplied to the company by one of its directors, and not confirmed by a general meeting, was within the prohibition in the Joint-Stock Companies Act (7th and 8th of Victoria, cap. 110), and therefore void. Mr. Stears brought an action against the official manager in the Common Pleas upon his contract, but failed upon points of pleading. He had subsequently become insolvent. In June last, Hulett obtained a summons to have his claim allowed as a specialty or judgment debt against the company. The chief clerk decided against the claim, on the ground that, as Stears had failed to establish his contract, the debentures were without consideration, and that the judgment and payment of interest did not improve the claim of Hulett. The summons had thereupon been adjourned into court.

Mr. W. M. JAMES and Mr. ROXBURGH, in support of the application, contended that the company by their acts and conduct had recognized the validity of the debentures, and could not now be allowed to raise objections to them. They had full opportunity for contesting their validity upon the application by Hulett for his interest and his subsequent action. Nothing of the sort had been done, and the claimant had been induced to rely on the debentures and abandon his remedy against Stears, who was now insolvent. Persons dealing with a company were entitled to assume that if the company had the power to do the particular act, then that all the formalities required by the deed of settlement had been complied with. In the present case, there was nothing to affect Hulett with notice that Stears, whose name did not appear in the returns, was a director, so that, although the contract and the debentures might be invalid as to Stears, that invalidity did not affect Hulett.

Mr. SHEBBEARE (Sir H. Cairns with him), for the official manager, contended that the debentures were invalid, and that Hulett could stand in no better position in respect of them than Stears.

The VICE-CHANCELLOR said that the claim must be allowed. Although, as he had already held, the appointment of Mr. Stears to the office, singular as it was, of honorary director, rendered the contract of that gentleman invalid, yet there was nothing to affect Mr. Hulett, to whom the debentures were assigned, with knowledge that Stears was a director. On the contrary, looking at the returns, which excluded all notice that Stears was a director, and the fact of his contract with the company, Hulett must be assumed to have known that Stears was not a director. Whether the debentures had been given to Stears in respect of money advanced by him or work done for the company, with respect to Stears himself they were rendered equally invalid by the Joint Stock Companies Act. But it was satisfactory to find authority for holding that Mr. Hulett, the assignee, was not affected by that invalidity. In a recent case of *Woodham v. the Anglo-Australian Mining Company*, Vice-Chancellor Stuart held that the assignee of debentures granted to a director in respect of his loan to the company was entitled to establish his claim, upon a statement made to him by the secretary of the company that everything was correct. That was a much stronger case than the present. Here the assignee had sued for the interest in the name of the assignor. The company had full time to consider their position. They had full notice of the action, which was in no sense a matter "lying within the breast" of the directors. But, instead of setting up the defence that the debentures were invalid, the secretary, upon the application of Mr. Hulett for his interest, applied for time. Time was granted, but judgment was ultimately obtained. The debentures themselves were sued upon, and there had been ample opportunity for the company to raise objections, but no objection had been raised up to the present time. Besides this, there was the balance-sheet, from which it was clear that the claim of Stears could be satisfied in no other possible way than by these debentures. At least, there was sufficient to put the company upon inquiry, especially when they were stimulated by having the action brought against them in the name not of Hulett, but of Stears. There was this additional ingredient in favour of the claimant's case, that he relied, and had been led to do so, on the debentures, and could have sued Stears personally, and recovered the amount from him, but could not do so now, as Stears had become insolvent. Without in any way making a precedent for the doctrine that the assignee of a *chose in action* could stand in a better position than his assignor, and distinguishing this case from some of those which had been cited—looking at all the circumstances, the balance-sheets which were before the shareholders, the absence of any contest as to the validity of these debentures, the payment of a portion by the company, the reliance which Hulett had been induced to place in the debentures themselves, and the subsequent insolvency of Stears—looking at all these circumstances, the claim must be allowed.

COURT OF QUEEN'S BENCH.

WESTMINSTER, FRIDAY, JAN. 24.

(*Sittings in Banco, before Lord Chief Justice* COCKBURN, *and Justices* CROMPTON *and* MELLOR.)

LADY MEEK *v.* LANGDON.

The plaintiff in this action, Lady Meek, sued the defendant W. E. Langdon, clerk to the Local Board of Health at Ilfracombe, in an action of trespass, to recover damages for fixing lamp-irons and a gas-pipe to the front of her house at Ilfracombe. The questions in dispute were raised in the form of a special case for the opinion of this court. They were—first, whether the local board had any authority at all to fix up the lamp-irons and gas-pipe in question; and, if so, whether they could do it without first obtaining the plaintiff's consent? It appeared, from the case, that the Lighting and Watching Act, the 3d and 4th William IV., cap. 90, had been adopted at Ilfracombe, as well as the Public Health Act, 1848 (the 11th and 12th Victoria, cap. 63). By the 45th section, of the former Statute, power was given to the inspectors to fix lamp-irons to houses, they doing as little damage as possible; but the 46th section enacted, that it should not be lawful to fix any gas-pipe to the front of any dwelling house, without the previous consent of the owner or occupier. By the Local Government Act, 1858 (the 21st and 22d Victoria, cap. 98), it was enacted, that wherever the 3d and 4th William IV., cap. 90, had been adopted, it should be "superseded" by the Local Government Act; but, this latter Statute contained no provision expressly giving power to fix up lamp-irons or gas-pipes, or, indeed, to light and make rates for lighting the local district. It was surmised that, as the Local Government Act superseded the Lighting Act, it transferred its powers to the new body.

Mr. GARTH, for the plaintiff, contended that there was now no power to fix up lamp-irons and gas-pipes, and certainly not without the previous consent of the owner or occupier, which, in this instance, had not been obtained.

Mr. M. SMITH, Q.C. (with whom was Mr. Prideaux) was heard for the defendant.

Lord Chief Justice COCKBURN said, there was no power in the Act which was said to be "superseded" to authorize the fixing up of the gas-pipe without consent. There would, therefore, be judgment for the plaintiff, with 40s. damages, and an award of an injunction upon that part of the case. But it was unnecessary to decide the other questions.

Mr. SMITH said, he hoped it would be understood that the court decided nothing as to the power to light and make rates, &c.

Lord Chief Justice COCKBURN said the court would not decide that matter. Judgment accordingly.

GREENWICH POLICE-COURT.

TUESDAY, JAN. 21.

(*Before* D. MAUDE, *Esq.*)

CONVICTION FOR FRAUDULENTLY USING GAS.

Edward Luck, gas-fitter, and *Thomas Allpress*, shoemaker, carrying on business at Lewis Place, Lewisham, were charged with unlawfully laying a certain pipe to communicate with a pipe belonging to the Phœnix Gaslight and Coke Company, without the consent of the said company.

It appeared from the evidence that the defendants are brothers-in-law, each carrying on his trade in the same premises—the shop being double-fronted, and the defendant Luck uniting the trade of a saddler with that of a gas-fitter. A few days since, a written communication was received by the company's manager, stating that gas was used at the defendants shop which was not paid for. The inspector and his assistant accordingly went to the premises on the evening of Saturday, the 11th inst., when, finding Allpress at work, they told him they had come to look at the gas-meter, for it was thought there was something wrong. Allpress replied that Luck was not at home, and asked them to call again in half an hour. This they declined doing, and, on the inspector lighting a taper to aid him in his inspection, Allpress jumped from his seat, and turned the whole of the gas off at the main, thus extinguishing the lights, and leaving the place in darkness. A second taper was then lighted, when Allpress was observed doing something to the meter, and, on being pulled away by the inspector and his assistant, it was ascertained that piping had been fixed at one end to the inlet-pipe from the service-pipe, and the other to the outlet-pipe, thus obtaining a supply of gas without its entering and being registered as passing through the meter. The defendant Luck came in at this moment, and, hearing what had taken place, declared he knew nothing whatever of the connexion having been made.

Mr. MOTE, solicitor, who appeared for the defendants, said, by his advice, Allpress would plead guilty. He had made the connexion for the purpose of obtaining a greater intensity of light, being near-sighted, but altogether unknown to Luck, who allowed him to carry on his business of a shoemaker at the shop, he (Luck) leaving at night, and sleeping at a house nearly two miles away.

In answer to the magistrate, Mr. *Hunter*, the gas company's manager, said the defendant Luck was the person who paid the company for the gas charged for, and that no greater intensity of light was obtained by the connexion named, the only effect of which was to get the gas without paying for it.

Mr. MAUDE said a very serious offence had been committed, and the only conclusion he could come to was, that Luck knew of what had taken place as well as Allpress, who had taken upon himself to plead guilty, with a view of screening the other defendant. The Act of Parliament imposed a penalty of £5 for making such improper connexion, and a further sum of 40s. per day for each day such illegal consumption was proved to have existed. He should, therefore, fine each of the defendants in the full penalty of £5 and costs, and Luck should also pay an additional fine of 40s. for the one day's consumption, which it had been proved was improperly obtained.

The money, amounting to £12. 4s., was immediately paid.

Miscellaneous News.

ROYAL MEDICAL AND CHIRURGICAL SOCIETY.

JAN. 14, 1862.

A very interesting paper on the Poisonous Effects of Coal-Gas upon the Animal System, by C. J. B. ALDIS, Esq., M.D., Medical Officer of Health for St. George's, Hanover Square, was read.

The author felt induced to make the present inquiry in consequence of the examination of gas, as to its purity, now forming an important branch of the public health. He also wished to ascertain whether cannel gas destroyed life sooner than common gas, since this question had arisen at a recent coroner's inquest. The third and fourth objects were to counteract, if possible, by publicity, the want of precaution often displayed by gasfitters, and to try means for their recovery when rendered insensible.

For these reasons, he made some experiments with Mr. F. J. Evans, engineer of the Chartered Gas-Works, Westminster, and Mr. Bannister, assistant engineer, at the works in Horseferry Road, on November 8, 1861.

A rat was first killed, in order to compare the internal organs with those of others destroyed by the gases. The eyelids were closed; the lungs collapsed, and of a whitish colour; both ventricles of the heart contained black coagulated blood.

Six experiments were then made—two with cannel gas, three with common, and one with foul gas. The rats were placed under a glass vessel, into which the gases were passed. They soon began to gasp, and became insensible; but, after lying motionless for a few seconds, convulsive movements occurred, upon which death ensued.

The eyes were open, and projected; the outer surface of the skull was exceedingly red in all that were examined, and dark fluid blood escaped from them, when the head was opened; the vessels on the surface of the brain were pinkish, and some empty; the substance of the brain pale; the lungs collapsed, and of a pinkish colour; the heart distended with dark fluid blood; congestion of the abdominal veins.

The eyes of the rat destroyed by foul gas did not project so much, and, on opening the body, a strong smell of sulphuretted hydrogen escaped. The brain and lungs were much congested, and of a brownish colour; the heart greatly distended with dark fluid blood—the auricles being nearly black; the abdominal veins gorged with black blood.

The rats compelled to breathe cannel gas died sooner than those exposed to the influence of common gas. Some remarks were then made upon the physiological effects, and the constituents of coal-gas—the author quoting Mr. Lewis Thompson and Dr. R. D. Thomson upon the latter subjects.

The author produced the *post-mortem* appearances of some cases printed in Dr. Taylor's work on poisons, wherein it appears that the gas was respired in a diluted state and for a long time, which might account for the difference in the results found in them and in the preceding experiments.

Mr. William Bloxam, jun., had favoured the author with the account of a fatal case of poisoning by coal-gas, which had recently occurred at No. 20, Mount Street. The man was found dead on the top of a pair of steps, in a closet, in a sitting posture.

The author thought the man should have been doubly cautious in his mode of making the connexion of the pipe with the meter, when it is considered that his head was at the upper part of the closet, on a level with the fanlight over the door, for, while the gas escaped, this part formed a kind of gasholder. The deceased, having become insensible, was unable to lower his head beneath the frame of the fanlight; or, had he but struggled and fallen, his life might have been spared.

The anæsthetic property of gas was noticed, and the symptoms, after recovery from the state of insensibility, were detailed.

The paper concluded with an account of further experiments, conducted in the same manner as the foregoing, except that the animals were rendered insensible only—four being afterwards exposed to fresh air, another to the action of ammonia and fresh air, and the sixth placed under a glass filled with oxygen. The animals exposed to fresh air recovered more quickly than when other means were adopted.

An animated discussion followed, in which Dr. Kidd, Dr. Robert Barnes, Dr. Marcet, and others joined.

METROPOLIS GAS SUPPLY.

CITY COURT OF SEWERS, GUILDHALL, TUESDAY, JANUARY 14, 1862.

At a Meeting of the Commissioners held this day—Deputy CHRISTIE in the chair—a report was brought up from the special committee on gas, to whom, at the last court, it was referred to consider and accept a tender from the Great Central Gas Company for the supply of the public lamps for one year from the 1st of February next, stating that they had received the following tender from that company:—

To the Honourable the Commissioners of Sewers of the City of London.

Great Central Gas Company, Coleman Street, E.C., London, Jan. 7, 1862.

Gentlemen,—I am instructed by the board of directors of the Great Central Gas Company to add to the tender for the supply of gas to the public lamps of the City, sent in on the 17th of December last—an offer to supply lights consuming 3 feet of gas at a proportionate price to those consuming 5 feet—viz., £3 per lamp—subject to the same conditions as are contained in the last contract. If the process of carburetting the public lamps be adopted, such process to be carried on at the cost and risk of the commission.

(Signed) R. T. MASSEY.

The report stated that the committee had explained to Mr. Bovill, one of the directors, who, with the secretary, attended them on behalf of the company, the intention of the commissioners to apply the carburetting process to the public lamps, and he stated that the company would act according to such arrangement, and accepted the terms of the contract accordingly.

The court accepted and approved the report of the committee.

Deputy LOTT moved, pursuant to notice, "That, inasmuch as the discussions in the Commission of Sewers on the subject of gas have occupied a great many days, to the interruption of the regular business of the commission, special days be appointed from time to time for the discussion of all questions relative to gas."

The motion, not being seconded, fell to the ground.

TUESDAY, JAN. 21.

The contracts with the Chartered and Central Gas Companies, and the Carburating Gas Company, were brought up, and agreed to.

SALE OF GAS ACT.

COURT OF ALDERMEN, TUESDAY, JAN. 21.

THE CITY OF LONDON JUSTICES AND THE METROPOLITAN BOARD OF WORKS.

At a Meeting of the Court of Aldermen held this day at Guildhall—the Right Honourable the LORD MAYOR presiding,

Alderman WILSON presented the following memorial, which was read by the town-clerk:—

To the Right Honourable the Lord Mayor and the Court of Aldermen.

The undersigned gas-meter manufacturers, who carry on their business in London, beg respectfully to memorialize your honourable court, in consequence of its appearing, by the published reports of the proceedings of the Metropolitan Board of Works, that it is the intention of the said board to include the City of London within the area of one or more of their gas-meter inspectors districts, and thereby ignore the legality of the appointment of an inspector already made by your honourable court, and of all acts performed by him.

The undersigned feel that it is of the greatest importance, not only to their interests, but also to the interests of the public at large, that the validity of the appointment of your inspector should not be ignored, but that the office and appointment held by the present or any future inspector appointed, or to be appointed, by you, should be maintained independently of the Metropolitan Board of Works; therefore, they, the undersigned, earnestly pray that, if the Metropolitan Board of Works should persist in the course which it is now pursuing, your honourable court will take such steps, as to them may seem best, to resist the encroachment of the Metropolitan Board of Works with respect to the independence of the office of inspector of meters for the City of London, and with the prerogative of the said justices under the Sale of Gas Act.

WALTER FORD, Foundling Terrace, Gray's Inn Road.
JOSEPH BOULTON, 28, Bagnigge Wells Road.
F. W. HARTLEY (Manager of A. Wright's Gas-Meter Works), 55 and 55 A, Millbank Street, Westminster.
JAMES PINCHBECK, 35, Whiskin Street, Clerkenwell.
WILLIAM SUGG, 19 and 20, Marsham Street, Westminster.
STEVENS and SON, Darlington Works, Southwark.
THOMAS EDGE, Meter Works, Westminster.
I. BRIGGS, 103, Southwark Bridge Road.
CROLL, RAIT, and Co., 10, Coleman Street, City.
HENRY A. DUCKHAM, 44, Clerkenwell Green.
WILLIAM RICHARDS, Crawford Passage, Clerkenwell.
WILLIAM SMITH, 21, King Street, West Smithfield.
JAMES MEACOCK, 7, Snow Hill.
N. DEFRIES, Diana Place, Euston Road.
D. HULETT, 55 and 56, High Holborn.
W. C. PARKINSON, Cottage Lane, City Road.
WILLIAM DONALD and Co., 35, Britannia Street, City Road.
HENRY JONES, 136, Old Street, St. Luke's.
BISCHOFF, BROWN, & Co., George Street, Great Portland Street.
GEORGE SHEARMAN, 6, Haggerstone Lane.
THOMAS SUGG, 168, High Street, Hoxton.
FREDERIC HUDSON, 227, Blackfriars Road.
C. R. MEAD, 1, Sugden Terrace, Hill Street, Peckham.
F. G. UNDERHAY, Crawford Passage, Clerkenwell.
W. HUNTER (for J. Milne and Son), Crescent, Blackfriars.

A considerable number of the memorialists were in attendance.

Alderman WILSON said he was quite sure the court would be gratified to receive such a memorial from the gas-meter manufacturers of the City of London and parts adjacent, more especially when he informed them that he was given to understand it had been signed by every maker of meters in the metropolis, with one exception. This court had taken a great deal of trouble in endeavouring to carry out the Sale of Gas Act for the benefit of the trade and of the public at large, in defiance of certain difficulties and obstructions placed in their way, more particularly by one manufacturer of gas-meters. Previous to the passing of the Act of last session the justices of the City of London had prepared all the necessary measures for giving effect to the Act of 1859, and had appointed an inspector to test and stamp meters. In August 1861, an Act was passed which transferred from the justices of the peace for the counties of Middlesex, Surrey, Kent, and Essex, the jurisdiction which they acquired by the Act of 1859, to the Metropolitan Board of Works, the reason being that the justices had neglected to adopt the provisions of that Act within the time limited by the Legislature. Had they chosen to do as the City of London had done, they would still have possessed authority in the matter, and the management of the testing and stamping of gas-meters would have remained in their hands, instead of being as now vested in the Metropolitan Board of Works. The Act of Parliament by which the jurisdiction of the justices was transferred to the Metropolitan Board was passed in August last, and came into operation on the 13th of October. It was impossible, therefore, for the Metropolitan Board of Works to make the necessary preparations within that time, which the justices of the City of London had commenced in 1860. One of the manufacturers of meters took counsel's opinion immediately after the Act passed, and served the magistrates of the City of London with notice that they had no power to stamp meters in consequence of the new legislation upon the subject. The magistrates thought differently, and went on with their operations. This individual, who was the only maker in London who had not signed the petition to the court, took, as he had said, counsel's opinion, and served notice upon the magistrates that they were acting illegally, and that for every meter they stamped they would be liable to a £5 penalty. Upon this, the magistrates determined, although they believed they were doing right, not to make themselves unnecessarily liable in the matter, and, accordingly, they directed their inspector to go on stamping everybody's meters, except those of the individual who disputed their jurisdiction, and had served them with notice of the illegality of their proceedings. This party, finding the trade going from him in consequence of his meters not being stamped, took out a summons against the City inspector for acting illegally, in not stamping his meters. The magistrates, thinking that he had got a different opinion, then ordered his meters to be stamped as well as those of other makers, and this very party, at the present moment, he (Alderman Wilson) was told, though he objected to sign the petition, highly approved of the jurisdiction in this matter being in the hands of the magistrates of the City, in preference to its being in the hands of the Metropolitan Board of Works. The court, therefore, had before them, in this petition, an expression of the wish of the whole of the London trade, and a request that the magistrates of the City would keep the power in their own hands, and that if it should be found they had no right to exercise that jurisdiction in consequence of the Act of last session, they would apply to Parliament to legalize what they had done, and to restore the power which they originally possessed by the Act of 1859. He again said he felt that the court would be gratified with this expression of the feeling of the trade, and to receive such a testimony to the satisfactory mode in which they had endeavoured to carry out the provisions of the Act for the benefit of the public. He asked them to consider in what a position the trade would have been, but for the exertions which the City magistrates had made in the matter. Their inspector had stamped, since he commenced operations, no less than 26,825 meters. He believed it was pretty well known that the Metropolitan Board were stamping meters as fast as they could, and were doing all in their power to accommodate the public, but they had not got all the apparatus necessary. With all the exertions of the board, it was evident that, had not the magistrates of the City taken the steps they had done, the 26,825 meters which their inspector had tested would still have been unstamped. The trade felt that they had been benefited by the course taken by the City justices; and it was an act of gratitude on their part to come forward, and, in this memorial, urge the justices to endeavour to keep the power in their own hands, in preference to allowing it to pass into the hands of the Metropolitan Board of Works. It would, also, be gratifying to the magistrates to know that the public at large had so high an opinion of the corporation of the City of London, and the way in which they prosecuted business, that many persons outside the City objected to have their meters stamped by any one except the City inspector. Amongst other applications, the justices had been asked whether they could undertake to stamp 100 meters a week to go to America? Of course, they could not undertake to do so while they could not fully meet the requirements of their own immediate district; but he had heard that, notwithstanding their determination in this respect, some manufacturers had sent in meters for stamping, which had afterwards been sent to America. Another fact, still more gratifying, was, that in some cases, where meters had been stamped by the Metropolitan Board inspectors, parties had objected to have them put up in their houses until they had been sent to the City inspector's office, to get his stamp upon them. This showed that the work was being done efficiently, and the course adopted by the City magistrates was generally approved of. He thought, as many of the meter manufacturers of the metropolis were present, it would be very gratifying to them to know that there was no necessity for the magistrates to go to Parliament to obtain fresh powers and to legalize what they had done. Within the last few days, the Government had sent to the Lord Mayor an opinion which they had received from the Attorney-General and the Solicitor-General, upon a case stated by them fully and impartially, as to the effect of the Act of 1861, in reference to the jurisdiction of the City justices. That opinion he would now ask to have read, as it would be gratifying to the gentlemen who had signed the petition to have it certified, on the high authority of the law officers of the Crown, that the City magistrates had acted rightly, and that the Metropolitan Board of Works had no *locus standi* in the City of London.

The TOWN-CLERK read a letter from Secretary Sir George Grey, enclosing the following opinion:—

We are of opinion that the 24th and 25th Vict., c. 79, does not transfer the powers conferred by the principal Act, 22 and 23 Vict., c. 66, on the justices of the county of the City of London, to the Metropolitan Board. The powers transferred are in terms, the "powers conferred on the justices of the peace of any county, &c., so far as relates to the metropolis defined by the 18th and 19th Vict., c. 120." Within the metropolis, as so defined, there are parts of four counties—Middlesex, Surrey, Kent, and Essex; and also the county of the City of London. The distinction between a county and a county of a city is carefully observed in the principal Act (see particularly sections 4 and 7). Thus, the expression "justices of the peace of any county," as used in the 24th and 25th Vict., does not necessarily include the justices of the peace of a "county of a city;" and that they were not intended to apply to the City of London appears to us to be placed beyond a doubt, by the proviso, that the expense incurred by the board in pursuance of the Act which directs the transfer shall be defrayed by them out of the rates leviable by them within their jurisdiction, "exclusive of the City of London." The expense within the City of London of carrying the Gas Act into effect had been previously cast on the consolidated sewer-rate of the City (section 7 of the principal Act), and it is not reasonable to suppose that it was intended to shift such burthen on to the ratepayers of the metropolis, "exclusive of the City of London."

(Signed) WILLIAM ATHERTON.
ROUNDELL PALMER.

Temple, Jan. 9, 1862.

Alderman WILSON then moved, "That the memorial of the gas-meter makers, and the opinion just read, be referred to the justices in quarter session assembled." In doing so, he stated that the memorial had been seen by a gentleman named Crosley, who was formerly a large meter maker, but was now retired from the business, and that gentleman assured him that it contained the names of every meter-maker in London, with the one exception alluded to.

Sir JAMES DUKE hoped that the opinion just read, and which was a very valuable one, would be entered on the minutes of the court.

Alderman WILSON thought it did not properly belong to the Court of Aldermen, but to the justices in quarter session.

The TOWN-CLERK said it would, nevertheless, be entered as a matter of course, having been read as part of their proceedings.

Alderman CHALLIS seconded the motion, and said he thought they were much indebted to the worthy alderman and gallant colonel (Wilson), for the explanations he had given to the court, and which it was very desirable should go before the public, in order to set the justices right in the course which they had taken.

The LORD MAYOR said, he felt it was due to Colonel Wilson that he should bear his testimony to the zeal, courage, and energy with which the gallant colonel and worthy alderman had persevered amidst the difficulties he had had to encounter in vindicating the position of the justices of the City of London. When, at one period, it was supposed by some gentlemen that the Act of last session really had transferred the powers of the magistrates to the Metropolitan Board, and that they would be incurring legal responsibilities by continuing to test meters, the clear and correct view taken by Colonel Wilson, and the energy and zeal which he threw into the matter, enabled the magistrates to take a decided course, and to render great service to the trade and to the public at large.

The motion was put, and carried unanimously.

Alderman WILSON said the court were much indebted to the gentlemen who had appeared to-day in support of the memorial, for the trouble they had taken in the matter.

CITY OF LONDON COURT OF SEWERS, TUESDAY, JAN. 21.

At the Meeting of the Commissioners this day—Deputy CHRISTIE in the chair—

Mr. C. PEARSON (the City solicitor) attended with a copy of the opinion obtained by the Government from the Attorney-General and Solicitor-General upon the construction of the Metropolis Gas Amendment Act, 1861, as affecting the jurisdiction of the justices of the City of London, under the Sale of Gas Act, 1859. (See report of proceedings in Court of Aldermen.)

Deputy HARRISON said, this opinion which had been given by the law officers of the Crown upon a case, which brought before them all the facts, differed from the opinion of the present Attorney-General (Sir W. Atherton), when, as Solicitor-General, he was consulted by the Metropolitan Board of Works. He moved that a copy be sent to the Metropolitan Board for their information and guidance.

Mr. PEARSON said, the Lord Mayor had already directed a copy to be sent.

Mr. H. L. TAYLOR thought that, irrespective of what might be done by the City justices, this court ought to forward a copy of the opinion; and, as it was desirable the fullest information should be furnished, he suggested that a copy of the case should accompany it.

Mr. PEARSON said, the opinion was taken upon a case prepared by the Government, a copy of which had not been sent to the City authorities.

Mr. TAYLOR thought, the board should be informed on that point, because they would have to begin again *de novo*, as, under their present arrangements, the City of London was divided between two metropolitan districts.

Mr. DE JERSEY objected to the motion, on the ground that all they could do was to send the Board of Works the copy of an opinion, and that not an opinion taken by themselves.

Mr. PEARSON said, it would be as well not to irritate the members of the

Board of Works, and he was afraid this proceeding, though not intended to do so, would have that effect. The board and their solicitor had acted most courteously to him on the occasion of their taking the opinion of counsel in the matter, and it was desirable that this court should act in a similar spirit. In truth, the whole matter was one between the justices and the board, and not between this court and the board. The Commissioners of Sewers were only the paymasters under the orders of the justices.

Deputy HARRISON said he had no intention of recommending a course which would be likely to irritate; he had merely suggested it as an act of courtesy to the board.

After some further conversation, the motion was withdrawn.

Mr. PEARSON presented a further report, upon the application of Mr. Taunton's solicitors, for payment on account of his services while holding the office of meter inspector for the city. It stated that Mr. Taunton was duly appointed in May, 1860, under the section of the Sale of Gas Act, at a salary of £200 per annum, payable quarterly, and though, in consequence of the models not being received from the Exchequer, he did not execute the primary duty of his appointment—viz., that of testing and stamping meters—he did, in point of fact, render efficient service to the justices by superintending and arranging the adaptation of the building, and making the requisite preparations for the purpose. In the performance of that duty he had manifested great zeal, and though, in consequence of his resignation in July last, he had never been actually engaged in testing meters, yet the gentleman who succeeded him had been able to enter upon his duties more effectually under the arrangements made by Mr. Taunton than he could otherwise have done. At the time of entering upon his engagement, Mr. Taunton executed a bond, by which he was interdicted from carrying on any other business, although he was then, with the knowledge of the justices, acting as tester to the Great Central Gas Company, under an appointment of the Court of Common Council, and continued in that office during all the time he held the situation of gas-meter inspector. It appeared doubtful whether his claim should be considered as for salary while he held that office, or for services *quantum meruit*. Probably, if the two were accurately weighed, there would not in either case be much difference in amount.

The report, on the motion of Deputy HARRISON, was referred to the General Purposes Committee.

METROPOLITAN BOARD OF WORKS.

FRIDAY, JAN. 24.

At the Meeting of the Board held this day at the Offices, Spring Gardens, Mr. THWAITES in the chair,

A letter was read from Mr. Cresy, principal assistant-clerk, asking for an increase of salary. Mr. Cresy reminded the board of his lengthened period of service, and stated that in addition to his ordinary engagements, he had had confided to him, since the passing of the Sale of Gas Act, the performance of duties which required professional skill and scientific training in arranging the numerous details necessary to enable the board to carry out a somewhat novel and delicate operation upon an extensive scale.

Mr. CARPMAEL moved that the letter be referred to the gas committee to examine and report, expressing an opinion that Mr. Cresy's duties had been very largely increased, in consequence of the administration of the Sale of Gas Act in the metropolis having been confided to the board.

Mr. BRISTOWE seconded the motion, and said if it were true that additional duties had been thrust upon the applicant, not by the mere development of the business of the board, but by the passing of an Act of Parliament, he ought to receive additional remuneration.

Mr. ROBINSON inquired the amount of Mr. Cresy's present salary?

The CHAIRMAN: £350.

Mr. ECKETT opposed the motion, and expressed an opinion that any extra duties cast upon Mr. Cresy had not given him an hour's additional labour. One would suppose that before the Sale of Gas Act came into operation, Mr. Cresy's time was not half employed, and that that Act was a kind of god-send for him. Certainly, if his time was fully occupied before, a part of his duties must now be thrust upon some one else. He (Mr. Eckett) had heard it stated that there was an impression that Mr. Cresy had been put into some office in connexion with the administration of the Gas Act, as a stepping-stone to an increase in his salary. As to any additional service arising out of that Act, he believed it would turn out, upon inquiry, to be all moonshine. The inspectors were scientific men, and did not want looking over in the way suggested. He considered that, as an assistant-clerk, the present salary of Mr. Cresy was amply sufficient.

Mr. PECKETT deprecated any discussion of the subject in the open board. The committee was the proper place to inquire into the duties and remuneration of their officers. It was evident, from the remarks of the last speaker, that he knew nothing about the nature of the services which, under the Sale of Gas Act, were imposed on Mr. Cresy.

Mr. H. L. TAYLOR could see no reason for deprecating the discussion. To send this letter to the committee, would be to raise hopes that an increase of salary would be made. It was the duty of the board, first of all, to ascertain whether there was any ground for a reference, because the fact of a reference implied a forgone conclusion that an increase was equitable. He quite agreed in the remarks of Mr. Eckett as to the adequacy of the present salary. He felt that Mr. Cresy ought to fill the office of assistant engineer; he was well qualified for it, and as such would be entitled to a higher scale of remuneration, but in the office of assistant-clerk he was amply paid. What were his duties, no one could tell. In fact there were no special duties attached to the office, and yet for the last six years Mr. Cresy had received £350 a year. He had been a sort of incubus upon the board, and £200 a year would have been an ample salary for any services he had rendered. Why should they try to make a place for this gentleman? When he was originally appointed, the committee recommended that his salary should be £300, but the board, by the casting vote of the chairman, fixed it at £350. With reference to the Sale of Gas Act, he pointed to the City of London, where it was in efficient operation without the appointment of any officer to look after the inspector.

Mr. LE BRETON bore testimony to the efficient mode in which Mr. Cresy had attended to all the duties that devolved upon him.

Mr. HUGHES thought there were strong claims on the part of Mr. Cresy for the consideration of the board, because he had to perform duties of a peculiar nature, which it was never expected he would have to attend to. He had rendered most valuable service in connexion with the Sale of Gas Act, and had exercised an extraordinary amount of care and ability in framing regulations for the inspectors of meters, and in preparing forms for their use, which would enable them to discharge their functions in a way which would redound to the credit of the board. Any comparison between the operations of the board under the Act, and what had been done in the City, must be made with a very large consideration of the varying circumstances of the case, and the mode in which the work had been done. When the meters tested by the metropolitan inspectors were examined, and when the way in which they had worked came before the public, it would be found that the board were fully justified in all the expenditure they had incurred, and that they had not done wrong in paying a superior officer to attend to it.

Mr. FREEMAN said he was surprised to hear Mr. Eckett say that no supervision was required and exercised by Mr. Cresy.

Mr. ECKETT said, the point of his observation was, that Mr. Cresy's services were not needed to control the operations of persons who had scientific knowledge to qualify them for the discharge of their duties.

Mr. FREEMAN said, a vast amount of supervision and labour had been necessary in the providing of testing-houses and the arrangement of the necessary apparatus. He could state, from having attended all the meetings of the gas committee, and having endeavoured, to the best of his ability, to bring the Act of Parliament into operation, that the committee could not have done what they did in double the time, or with half the accuracy, for the benefit of the metropolis, but for the labours of Mr. Cresy. As to a comparison with the City, he believed that, when a comparison came to be made, it would be found that, in the case of the metropolitan inspectors, there had been a real testing of meters; and in the other, he was afraid, nothing of the kind.

Mr. ROBINSON said, if additional duties were cast upon Mr. Cresy, in consequence of the Sale of Gas Act, the probability was that those who were employed under him, had to perform a portion of the services which that gentlemen formerly rendered, and the consequence of the success of the present application, would be that they also would apply for increased salaries.

Mr. LEGG thought, it was not necessary to send the matter to a committee as in 1859, a similar reference led to a recommendation that Mr. Cresy's salary should be increased, clearly showing that at that time it was not considered he was overpaid. The board did not then adopt the recommendation, but seeing they had since given Mr. Cresy the superintendence of the Sale of Gas Act, he thought they could not do better than at once give effect to it.

Mr. DOULTON urged that the matter should go to the committee, in order that, by an investigation, the calumnies of Mr. Taylor, upon their officer might be refuted.

Mr. MORELAND said, he had always regarded the salary of the chairman's secretary as too high. Directly he heard that Mr. Cresy had been lugged into the matter of the Gas Act, he was convinced that it would be made the ground of an application for increased salary. Until that was done, Mr. Cresy could have no justification for such an application. Previously, he believed, Mr. Cresy had nothing to do, but to read the penny publications sent forth from different parts of the metropolis, for the information of the chairman.

The CHAIRMAN said, Mr. Moreland exhibited as much absence of information about the engagements of the chairman of the board as he did about the officer whose case was now under their consideration. If he entertained such a notion about Mr. Cresy's duties, and had applied to him (the chairman) he would soon have been satisfied that that notion was erroneous.

Mr. MORELAND said, his belief was that Mr. Cresy had nothing to do until the Gas Act came into operation.

The CHAIRMAN said, Mr. Cresy not only had engagements at the office, but he was in the habit of taking documents home with him for the purpose of collecting information for the use of himself and other members of the board, and during the last few months, since he undertook the special duties which had been referred to, he had had many hours of work after the regular business of the day.

Mr. PHILLIPS supported the application, believing that Mr. Cresy had been of great service in arranging the necessary details for bringing the Gas Act into efficient operation. He (Mr. Phillips) saw by the papers that all the meter makers of London, save one, had addressed a communication to the Court of Aldermen requesting them to maintain the right of the City justices to stamp meters. He immediately referred that fact to the circumstance mentioned by Mr. Hughes, viz., that this board were doing their work well.

The CHAIRMAN called the honourable member to order.

Mr. PHILLIPS continued: He referred it to the fact that this board were doing their work well, and, consequently, not so acceptably to the meter-makers of the metropolis.

Deputy HARRISON would support the reference to the committee, but not on the grounds advocated by some previous speakers. Mr. Cresy, in his application, suggested that, because he had been employed in arranging measures for bringing the Sale of Gas into operation, therefore, he had a claim for an increase in his salary. He (Deputy Harrison) knew the nature of the work performed, and could see in it no ground whatever for the application. He endorsed all that had been said as to Mr. Cresy's abilities, but he believed that his interference with the gas-meter inspectors, after they were appointed, was illegal and improper. This board were a court of appeal under the Act of Parliament, in reference to the conduct of the inspectors; and it was clear, therefore, that they could not legitimately interfere with the management of their office. That was, he believed, the decision of a magistrate; and in it he quite concurred. When this board had built the testing-houses, fitted them up, and put them in operation, what further work had they to do in the matter? On this ground, therefore, there was no reason for increasing Mr. Cresy's salary. There might be very good reason for saying that, as that gentleman had been very useful in enabling the board to inaugurate the Act, now that his duties had ceased, and his services in that direction would no longer be required, some *douceur* should be presented to him; but to say that an occasional increase of duty was a reason for a permanent increase of salary, was absurd, and, on this account alone, he should have objected to the reference. But other statements had been made, which appeared to render such a reference necessary, and he should vote for the motion, while taking exception to the argument that the occasional service under the Sale of Gas Act entitled Mr. Cresy to ask for an increase of salary.

Mr. CARPMAEL replied, and, in the course of his remarks, said, it was imagined that, because in the City no such officer as Mr. Cresy was appointed, therefore, it was not necessary here. But it should be remembered that in the City there was only one inspector, whereas the board had four. He did not think it indicated a foregone conclusion in favour of an increased salary to vote for the reference, but merely a conviction that inquiry into the duties and remuneration of the officer was desirable.

The motion was then put, and carried by a considerable majority.

The CLERK read the following letter from the City Remembrancer:—

Remembrancer's Office, Guildhall, Jan. 21, 1862.

Metropolis Gas Act Amendment Act.

Sir,—I am directed by the Rt. Hon. the Lord Mayor to transmit to you, for the information of the Metropolitan Board of Works, the enclosed copy of an opinion of Her Majesty's Attorney and Solicitor-General upon the subject of this Act, which the Lord Mayor and justices of the City of London have received from the Home Office.—I am, &c., (Signed) E. TYRRELL.

J. Pollard, Esq.

The opinion (for which see report of proceedings at the court of aldermen) having been read,

Mr. ROCHE moved that the opinion of Sir W. Atherton and Mr. Gray, obtained by this board in October last, be now read.

The motion was agreed to, and the clerk read the opinion, as given in the JOURNAL OF GAS LIGHTING, for Nov. 5, 1861, in which the learned counsel stated that the jurisdiction of the City justices was by the Act of last session transferred to the Metropolitan Board, to whom also all appeals from inspectors and magistrates were to be made.

Mr. CARPMAEL thought the board ought to be in possession of the case upon which the Attorney and Solicitor-General's opinion had been taken.

Mr. LE BRETON said, it was a case prepared by the Government, and it was not usual for copies of such cases to be furnished.

Mr. SMITH (the solicitor of the board) said he had received a communication from Sir William Atherton and Mr. Gray, in which they stated, in effect, that they were convinced their former opinion was wrong, and gave reasons for altering it.

Mr. LE BRETON inquired whether that communication had been sought or volunteered?

Mr. SMITH said, the Attorney-General wrote to him, asking him to call at his chambers, and take with him the case upon which the opinion was given by him and Mr. Gray. He (Mr. Smith) waited upon the Attorney-General, and found him and Mr. Gray in consultation upon the subject. They then stated that their attention had been carefully drawn to the Sale of Gas Act, and that their previous opinion in reference to it was not one which, upon mature consideration, was justified. They promised to give their altered opinion in writing; and, if any facts were misconceived by them, they would be glad to have their attention called to the circumstance.

Deputy HARRISON moved that the document referred to be read.

The CLERK thereupon read the following:—

Since writing our opinion of the 21st of October last, we have had occasion to reconsider the question whether the statute 24 and 25 Vict., c. 71, being the Act to amend the Metropolis Gas Act, brings the City of London within the jurisdiction of the Metropolitan Board of Works; and that reconsideration has led us to alter the opinion we then gave.

The view we now take of the Act is this: the powers transferred by the Act are expressed to be "the powers conferred on the justices of the peace of any county" within the defined metropolitan area; and, although the City of London is undoubtedly a "county," yet it is a "county of a city;" and the Act conferring the powers (being 22 and 23 Vict., c. 66), in doing so, carefully, distinguishes between counties and counties of cities—clearly showing thereby that, as regards that enactment, the one was not meant to include the other. The two Acts to which we have referred being strictly *in pari materia*, the same restricted meaning would, according to ordinary rules of construction, be assigned to the same expression ("justices of counties") as occurring in each of the Statutes, and, that such restriction was intended, appears to us to be placed beyond any reasonable doubt by the proviso that the expenses of, and attending, the exercise of the powers transferred, are to be defrayed out of rates to which the City of London is not to contribute.

We are, therefore, of opinion that the Act confers on the Metropolitan Board of Works no power or jurisdiction within the City of London.

Temple, Jan. 10, 1862. (Signed) WM. ATHERTON.
JOHN GRAY.

Mr. D'IFFANGER asked what fee was paid to the Attorney-General for his first opinion?

Mr. SMITH: Ten guineas.

Mr. D'IFFANGER: As that opinion was wrong, I think we ought to ask him to give us the money back again. (A laugh.)

Deputy HARRISON moved that the opinion just read, together with that forwarded by the Lord Mayor, be referred to the Gas Act committee, with instructions to them to report what steps it would be necessary for the board to take in consequence.

Mr. FREEMAN said, there could be no objection to such a course; but he thought the districts had been so arranged, that no alteration would be necessary.

The CHAIRMAN also thought it would not render an alteration necessary.

Deputy HARRISON said, the City had been divided by the board, and apportioned between two districts, one on each side.

Mr. SAMUDA said, this question was one of considerable importance, and the board should take some steps to know the exact state of the case. As a member of the board, he could not think they were acting as reasonable men if they accepted as final a second opinion from the same counsel which flatly contradicted the first. He thought they should seek further advice, to fortify them in acting upon one or other of the opinions already obtained.

Mr. PHILLIPS considered it would be desirable to state a case for the opinion of the Court of Queen's Bench, rather than consult another counsel.

Mr. ECKETT opposed the idea of seeking any further advice in the matter.

After some further conversation, the resolution was agreed to; and, on the motion of Alderman LAWRENCE, it was resolved to send a copy of the Attorney-General and Mr. Gray's opinion to the City authorities, with an intimation that the whole question had been referred to a committee of the board.

PUBLIC LIGHT ARBITRATIONS.

WORTHING.

At the Ordinary Monthly Meeting of the Worthing Local Board of Health, held on Tuesday, the 7th inst.—

The CLERK read the award made by Mr. I. O. N. Rutter, of the Black Rock Gas-Works, Brighton, the arbitrator appointed by the Worthing Gas Company, and Mr. S. Hughes, of Park Street, Westminster, the arbitrator appointed by the local board, to whom it had been referred to settle the terms of a contract to be made between the gas company and the local board for the supply of gas to the street lamps. The following is an abstract of the award:—

The contract is to commence on the 1st of July, 1862, for seven years.

The company is to furnish a sufficient supply of gas, having the illuminating power and purity hereinafter described, for lighting at all such periods of the year, during the said term, upon such days and nights, and during such hours as the local board shall direct, the lamps now set up within the town, or hereafter to be set up; which gas shall have a pressure at every lamp-post, between the hours of sunset and sunrise, throughout the year, of not less than 7-10th of an inch head of water.

The company to provide a pressure-gauge for ascertaining the uniformity and sufficiency of the pressure; and also not less than four test-lamps with meters.

The company or their manager, on the first Monday in every month, with the town surveyor, to examine the meters, to agree upon the average gas consumed.

The gas supplied, under this contract, to be at all times of such an illuminating power, that 5 cubic feet of gas consumed in an argand burner, having 15 holes, and a 7-inch chimney, shall give a light equal to that of 12 sperm candles, each containing 120 grains an hour.

The gas, to be supplied under the contract, to be at all times of such purity as not to discolour moistened test-paper imbued with acetate or carbonate of lead, when such test-paper is exposed to a current of gas during the space of one minute, and shall not contain in 100 cubic feet of gas, more than 20 grains of sulphur in any form, nor more than five grains of ammonia.

It is to be lawful for the local board, at any time, to appoint a chemical examiner, or gas engineer, to test the quality or illuminating power of the gas at the town-hall, by means of the burner before referred to; and, should it be proved to the satisfaction of any justice of the peace, after hearing the parties having tested the gas, that the gas was not of the illuminating power, quality, or purity required by the contract, the company is to forfeit and pay to the local board a penalty of £10, and a further penalty of £2. 10s. for every day during which the gas continues to be defective.

The local board to pay, during the same term, the sum of 4s. 8d. for every thousand cubic feet of gas, which shall have been found to have been consumed, upon taking a quarterly average of the consumption of gas by the meters. Such payments to be made quarterly.

The local board to light, extinguish, and clean the lamps, and keep the glass in repair during the time.

The price of gas to private consumers not to exceed 6s. 3d. per 1000 cubic feet; and, in case the gas company shall, during the term, reduce the price to private consumers below 6s. 3d. per 1000 feet, then the gas company shall make a proportionate reduction in the price per 1000 feet of gas supplied to the local board.

If, at the expiration of the said term of seven years, the local board shall be desirous to continue to light the public lamps with gas, and shall be desirous to enter into a new contract with the said gas company for that purpose, then a new contract shall be entered into by and between the local board and the gas company, upon such terms and conditions, and under such stipulations, as shall be settled and determined by two indifferent persons—one to be elected by and on the part of the company, and the other by the local board—at least six months previous to the expiration of the term of seven years; which two persons, before they proceed to frame such terms, are to name an umpire, whose determination, in case of difference, is to be final.

The CLERK also read a letter which he had received from the secretary of the gas company, stating that the directors thereof had agreed to the terms; but, as they conceived it was not within the province of the arbitrators to settle the price to be paid by private consumers, the directors took exception to that part of the settlement being taken as a precedent.

The board passed a resolution directing the clerk to prepare the contract in pursuance of the award.

WATERFORD.

An arbitration, in reference to the proper charge to be made by the Waterford Gas Company to the corporation for the supply of gas to the public lamps of the city, commenced at the town-hall on Tuesday, the 14th inst., and only concluded on the following Saturday. Mr. William Davis, of Clonmel, acted as arbitrator for the company; and Mr. Daniel Cullen, of Limerick, for the corporation; and John Henry Richards, Esq., the chairman for the county of Waterford, acted as umpire. The corporation were represented by Mr. John O'Brien, town-clerk, and Mr. Delahunty, borough treasurer; and the company by Mr. David A. Nagle, solicitor (of the firm of Tracy and Nagle, Cork), and Messrs. Anderson and Jones, managers. Evidence was gone into on both sides at great length. Messrs. Anderson, Jones, Nagle, James Beale (Cork), Billows (Queenstown), and O'Hara (Waterford), were examined for the company; and Mr. Trowsdall (Limerick) for the corporation. The evidence closed on Thursday evening, and, the arbitrators having differed, the case was adjourned until the 18th inst. for the decision of the umpire.

Mr. RICHARDS stated as a difference had occurred between the arbitrators, and as the responsibility of deciding on so important a case rested with him solely, he had determined on giving his reasons for his decision. He referred to the company's Act, which in the thirty-third section enacted that if the company and the corporation should differ as to the price to be charged for the gas to the public lamps, the price should be settled by arbitration, and then proceeded. He said that the Act of Parliament, in consideration of the monopoly it conferred on the company, in regard to the breaking up of streets, and laying of mains, had defined the prices beyond which it would not charge private consumers. Of course, those prices would be regulated by the risk of competition. In regard to the public lighting, as it was a public necessity, the Legislature determined that arbitration should be the remedy to protect the corporation from exorbitant prices. The case had been in his (Mr. Richards') opinion very ably argued, and, from what was proved in evidence, it appeared to him that up to last year the company had charged £4 per lamp, having on the expiration of that contract required the sum of £4. 8s. 6d. per lamp, and, as the corporation would only give the old price, they called for arbitration pursuant to the Statute, and the parties having appointed arbitrators, and not having agreed on an umpire, the magistrates had appointed him as umpire. Viewing the case as one of extreme importance, not only in a financial view, but from the fact that his decision might affect other localities, he had given the case his best attention, and he was glad to be able to state that he felt no hesitation in the opinion he had arrived at. In regard to the public lighting of towns, he had found that the practice principally existing was this: companies who were solely dependent on the support and powers of corporations sought to propitiate the public bodies by supplying gas for the public lights of a town at a price far below that charged to private consumers. This habit obliged him to consider whether the public lights ought to be lighted at a loss to companies. It was too much the habit in Ireland to expect more than a fair day's work, and he could not see how the practice he referred to could be supported by any intelligent person; to make the public gas cheap at the expense of the private, was taking money from one man to serve another—in fact, it was robbing Peter to pay Paul. He considered that in this case the corporation had asked too much, and that the gas company had acted well and liberally. Reference had been made to Limerick, and to the scale of wages paid by the Corporation Gas Company in that city. He found that the wages paid by the company in Waterford, were far more liberal, and he considered that it would be better that the corporation recognized the justice of paying the labouring classes well. With these preparatory remarks, he would observe that all heat and irritation between the contending parties ought now to cease, finally and satisfactorily. To deal with the question at issue, he would turn to a document with which Mr. Jones, one of the managers of the works, had furnished him. It proposed to give Mr. Jones's deas of the price to be charged for a public lamp, lighted from sunset to sunrise. Burning 4 feet of gas per hour, this lamp would use in that time about 17,308 feet of gas. A charge of 5s. per 1000 feet was set down as a proper price for the gas; 13s. for lighting, extinguishing, and repairing; 3s. 4d. to repay investment in lamp outfit; and 3s. 2d. for renewal of lamp. These charges would bring out £5. 6s. 8d. as Mr. Jones's estimate. Now, it was his (the umpire's) business to cut down this charge as low as possible. He would, in the first instance, allow 4s. 6d. per 1000 feet for the gas, being about the price charged to the largest private consumer. He would disallow the intereet on the lamp outfit, considering that it was included in the charge for gas. This would give £3. 18s. as the price for the gas, and the other items which he would allow would bring the charge up to £4. 8s. 6d. This would include 10s. 6d. for lighting, cleaning, and extinguishing, and for repairs. The charge he would allow for gas he considered very moderate, and he would challenge any candid, unprejudiced mind to look at that account, which was tendered by Mr. Jones at the outset, and to cut it down

below £4. 8s. 6d. He (the umpire) could not do so. True it was, Limerick was alluded to as an instance in which the public lamps were lighted at a lower rate. He could not see that the Limerick corporation made gas at a profit, and certainly not for public lighting. Mr. Trowsdall, the former manager, the first day of his examination, stated that the corporation of Limerick made gas for public lighting at a profit; but, on the next day, with a creditable degree of candour, he corrected that statement. On the whole, he (the umpire) was satisfied, beyond a reasonable doubt, that he had arrived at a right conclusion. It might be said that, in the contract the company had made with their managers, a sum of 3s. 6d. per 1000 feet was too much to pay them for manufacturing the gas. He considered the charge a reasonable one, and he doubted whether, if the company made its own gas, they would, if all matters be taken into consideration, make it at a less sum; and, in the price he had fixed, he only allowed the company a profit of 1s. over what they paid their managers. The award, therefore, he should make would fix the price for public lamps in Waterford at the sum of £4. 8s. 6d. per lamp per annum, lighted from sunset to sunrise, and burning 4 cubic feet per hour. In case the corporation determined on not lighting the public lamps for three nights each moon, he would award that 10 per cent. should be taken off this sum.

Mr. Richards, having delivered his decision, then retired.

A discussion then arose between the mayor and the town-clerk on behalf of the corporation, and Mr. Nagle and Mr. Anderson for the company, in which it was asserted and denied that the award only regulated the price for one year. It was determined to send for the umpire; and, the subject in dispute having been mentioned to him on his return,

Mr. Richards stated, that he gave his award on the basis of a three years' contract, and, from what now had occurred, he had determined to allow the company £4. 9s. 8d. on each lamp, if the contract were only for one year. He felt bound to say that, had the company asked more than £4. 8s. 6d. originally, he would have allowed it to them, and he would recommend the corporation to take a contract at that sum for seven instead of three years. They might, it was true, think of making and burning their own gas, but, in doing so, he warned them against burning their own fingers. (Laughter.)

The proceedings then terminated.

HEIGHT OF VERTICAL JETS OF WATER FROM FIRE-ENGINES, OR FOUNTAINS.

[From the *Scientific American*.]

A body falling in vacuum from the force of the earth's attraction falls 16 feet in the first second, and at the end of the second it is falling at the rate of 32 feet per second; the velocity being constantly accelerated. If a flume or tank of water is pierced at its side, the water will issue with a velocity just equal to the velocity which a body falling from the level of the surface of the water would acquire when it reached the level of the orifice. If the jet is turned vertically upward, it will rise in a vacuum just to the level of the surface of the water; but in the atmosphere the height to which it rises is reduced by the resistance of the air. Small jets are reduced in height more than large ones, and it is only by an elaborate series of experiments that the ratio between the theoretical height of the jet due to its velocity, and the actual height to which it rises in the atmosphere, can be ascertained. A German engineer has recently made such a series of experiments, and we translate the following account of them from Dingler's *Polytechnic Journal*:—

Until quite recently, the experiments made by the French philosophers, Mariotte and Bossut, over a hundred years ago, have been the sole guide for determining the height of the jets of fountains or of fire-engines. It is well known that the results obtained from these experiments have been insufficient, owing partly to the small pressures or heads employed, and partly to the poor instruments of that time. It is, therefore, of great importance to the scientific world that a comprehensive series of experiments have lately been made by a German engineer, Mr. Weisbach.

The following tables give the result from experiments made with two different mouthpieces. The first mouthpiece was $\frac{3}{8}$ inch in diameter, $5\frac{3}{4}$ inches long, and the convergence of its sides was $5\frac{1}{4}°$.

Head in feet.	Height of jet in feet.
3	2,865
6	5,712
9	8,541
12	11,304
15	14,040
18	16,704
21	19,278
24	21,768
27	24,138
30	26,430
33	28,611
36	30,708
39	32,643
42	34,440
45	36,180
48	37,776
51	39,219
54	40,608
57	41,838
60	42,960

The second mouthpiece was $\frac{1}{2}$ inch diameter, $9\frac{1}{2}$ inches long.

Head in feet.	Height of jet in feet.
3	2,844
6	5,700
9	8,559
12	11,424
15	14,250
18	17,082
21	19,845
24	22,560
27	25,218
30	27,810
33	30,338
36	32,724
39	35,022
42	37,254
45	39,420
48	41,424
51	43,299
54	45,090
57	46,740
60	48,360

The following are some of the results arrived at by M. Weisbach:—

1. The resistance of the air for small velocities of discharge of from 5 to 25 feet, or for jets of from 1 to 10 feet height, is so small that the height of the jet can be taken as equal to the height corresponding to the velocity of discharge, without a perceptible error.

2. Under the same head or pressure, the height of the jet increases with the area or size of the orifice. The resistance of the air is smaller with thick than with thin jets; in order to obtain a greater height, therefore, not only a greater pressure but also a larger orifice is required.

3. Under otherwise equal circumstances, jets from circular orifices reach higher than jets from square or differently shaped orifices.

4. With equal velocity of discharge, and with the same area of the orifice, jets discharged without contraction rise higher than those with contraction. The resistance of the air is greater with the former than with the latter. Under otherwise equal circumstances, and if the head or pressure is not very small, jets from small conoidal or conical and internally-rounded mouthpieces rise to a greater height than jets from orifices in a thin plate.

5. With jets discharged from orifices in a thin plate, the coefficient, a, may be taken equal to 1, and the difference between j and h is perceptible only when the velocity of discharge exceeds several feet.

6. The height of the jet, j, does not increase in a simple ratio to the theoretical height, h, corresponding to the velocity; if h is not very large, the height of the jet is approximately

$$j = \frac{h}{a + bh + ch^2}$$

where a b c are coefficients, to be determined for each orifice by experiment.

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1½ in.	2 in.	2½ in.	3 in	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle	Wales.	Yorkshire, Derbyshire, and Staffordshire.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Pig Iron, No. 1	3 5 0	2 8 0	2 10 0	3 0 0	3 5 0
1¼ and 2-inch Socket-pipes	7 0 0	6 0 0	6 5 0	6 10 0	6 15 0
2½ and 3-inch ditto	6 10 0	5 10 0	5 15 0	6 0 0	6 5 0
4 and 5-inch ditto	6 0 0	5 0 0	5 5 0	5 10 0	5 15 0
6 inches and upwards ditto	5 15 0	4 15 0	5 0 0	5 0 0	5 10 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 15 0	5 0 0	5 5 0
Ditto, 2nd ditto, cold ditto	6 10 0	5 5 0	5 10 0	6 0 0	6 5 0
Tank-plates, ¼ thick and above	6 0 0	5 0 0	5 5 0	5 10 0	5 10 0

WROUGHT-IRON TUBING,

Subject to 40 per cent. Discount.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 3 to 12 feet—per foot	1 8	1 0	0 10	0 7	0 5	0 4½
Ditto ditto, from 6 inches to 18 inches—each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows (wrought iron)	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, ditto	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Nipples	1 3	0 9	0 8	0 6	0 5	0 4
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2-quart	15 0	14 0	13 6	13 0	12 0	—

COALS.—*Per Ton.*

Newcastle.—Unscreened.		*Scotch Cannel.*	
Whitwell Primrose	6s. 9d.	Boghead (at Leith)	45s. 0d.
Medomsley, Eighton Moor, and Burnhope	7 0	Kirkness, best	23 0
Pelaw	7 3	Capeldrae, 1st quality	20 0
New Pelton, Peareth, South Pelaw, Washington Hutton, and South Peareth	7 6	Ditto, 2nd ditto	12 6
Pelton	7 9	Lesmahago (at Glasgow)	25 0
Ramsay's Newcastle Cannel	16 0	Ditto (at Leith)	27 6
		Arniston	27 6
		Wemyss	20 0
		Knightswood	18 0
		Pirnie	14 0

FREIGHTS.

Coastwise—Newcastle.—Per Ton.		*Foreign.—Per Keel.*	
Chatham and Rochester	6s. 0d.	Barcelona	£25 0s.
Cork	10 9	Bordeaux	15 10
Dover and Folkestone	7 0	Boulogne and Calais	8 5
Dublin	11 3	Cadiz	16 10
Exeter Quay	9 9	Cronstadt	—
Ipswich	6 0	Copenhagen	—
London (Pool)	5 3	Genoa	23 10
Lowestoft and Yarmouth	5s. 0d. to 5 3	Hamburg	—
Lynn	6 0	Havre de Grace	9 15
Portsmouth and Southampton	8 0	Leghorn	23 0
Plymouth	9 0	Lisbon	16 10
Shoreham	—	Rotterdam	—
Whitstable	7 3	Stettin	—
Weymouth	8 0	Trieste and Venice	£22. to 25 0

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Best Newcastle Fire-bricks—per 1000	£2.10s. to	£2 15s. 0d.
Cliff's Fire-bricks (at Wortley)—per 1000		2 15 6
Ingham's ditto (at Wortley)—per 1000		2 15 0
Fire-clay Retorts—per foot run	5s. 6d. to	0 7 0
Tough Cake Copper—per ton		110 10 0
English Pig Lead—per ton		21 5 0
Welsh Bar Iron (in London)—per ton		6 5 0
Foreign Spelter—per ton		18 5 0
English Block Tin—per ton		120 0 0
Banca—per ton		134 0 0
Tarred Rope Yarn—per cwt.		1 6 0

CONTRIBUTIONS TO THE HISTORY OF NAPHTHALINE.

By M. J. Persoz.

[From the *Comptes Rendus.*]

After reading M. Roussin's interesting communication, on an artificial coloured product said to be identical with alizarine, I think I ought to make known to the academy the results I obtained two years ago, while studying, with M. Martel, the derivatives of naphthaline.

Starting from the fact established by us, that a mixture of commercial nitre and sulphuric acids, even in very variable proportions, will, when heated with naphthaline, readily yield coloured products, we have naturally been led to examine the action of concentrated sulphuric acid on the various nitrogenized compounds of naphthaline.

This is a very difficult study, however simple it may at first sight appear, because the least changes of the condition under which the experiment is performed, exercise a sensible influence on the results. The dye principle formed, possesses the property of madder in dyeing mordants; its colour varies from red to blue, and passes through all the shades of violet.

The blue was only obtained accidentally; and we are unable to state the precise conditions of its formation, though it appears to be due to molecular change in the nitrogenized naphthaline compound, under the influence of a physical agent.

As the violet-blue tints are the most beautiful, we have devoted most of our attention to them, and have endeavoured to produce them; thus working in an opposite direction to that of M. Roussin, who is chiefly occupied with the reds. We soon found that binitronaphthaline, heated with sulphuric acid only, was best suited to our purpose. In his last communication to the Institute (*Comptes Rendus*, vol. lii., p. 1033), M. Roussin says:—"By making concentrated sulphuric acid react on binitronaphthaline, no reaction takes place. The binitronaphthaline is completely dissolved when the mixture is heated to 250°, and the liquid takes hardly an amber colour. After boiling for a long time, the concentrated sulphuric acid began to react on this substance." Binitronaphthaline resists the action of sulphuric acid at a very high temperature, however, at about 300°; the colour of the solution, at first slightly yellow, deepens more and more, becomes cherry-red, and finally brownish-red, beginning, at the same time, to disengage a small quantity of sulphurous acid. The progress of the operation is easily followed by taking up occasionally a drop of the liquid with a rod, and dropping it into a glass of water. Thus at first a white milky precipitate is obtained, then a light violet; and finally, when the colour is completely developed, a dark violet.

The substance is then taken from the fire, and left to cool, when it is poured into a proper quantity of water and boiled. The liquid, filtered whilst hot, is of a deep-red colour, and deposits part of the colouring matter in a flaky state. Alkalies change it to violet red; and even when cold, silk was easily dyed violet by it. After being properly saturated with alkalies, and finally with a little chalk, it dyed mordanted cotton tissues with different shades, varying from lilac to black. The lakes with alum, tin, and lead for a base, are violet; those with iron for a base, were olive, and sometimes reached to black.

In fact, this solution does not seem to alter even during any length of time, in presence of sulphuric acid; though, when in contact with air and excess of ammonia, it changes to brown in a few hours, depositing a black powder, which becomes blue when dissolved in alcohol, and red in acids.

The black mass proceeding from the precipitation of the sulphuric solution by water, contains a large quantity of colouring matter, which we were able to separate by means of M. Payen's digesting apparatus. This colouring matter has a beautiful gold reflection, is very soluble in alcohol and pyroligneous acid; but very little soluble in water, ether, benzol, and bisulphide of carbon. As we have before said, it has many chemical analogies with alizarine. In fact, according to whether a bath is slightly acid or alkaline, we can dye the iron mordants to the exclusion of alum mordants, and reciprocally. Moreover, the dyed tissues bear brightening with soap, carefully done, that is to say, progressively. Finally, the colouring matter readily sublimates under the influence of a high temperature.

It is evident, then, that with binitronaphthaline and concentrated sulphuric acid only, without making use of a reducing agent, as M. Roussin has done, a colouring matter may be obtained with marked analogies to alizarine in its chemical properties; however, the observations I have made during my operations, have led me to doubt whether it is possible, even while obtaining perfect red tints, to prepare in this way a colouring matter identical with that of the madder.

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I am, dear Sirs, your obedient servant,
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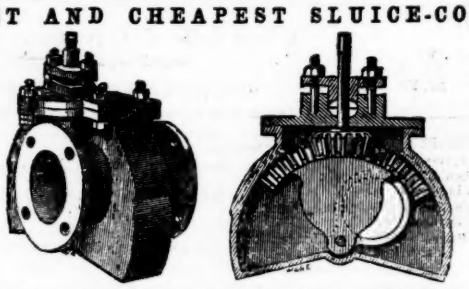

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GRAY'S INN ROAD, LONDON.
MANUFACTURER OF WET AND DRY GAS-METERS, STATION-METERS, GOVERNORS, &c. &c.

A large number of **STATION-METERS,** up to 80,000 feet per hour (being by far the largest in use), and **GOVERNORS** for **MAINS,** up to 24 inches, have been constructed by Paddon and Ford. These Meters and Governors possess peculiar advantages as regards strength and freedom of action.

Sole Manufacturer of **PADDON'S PATENT STREET-LAMP REGULATORS,** for insuring any required consumption. These Regulators are in general and increasing use, and references can be given to Gas Companies who use them for every Lamp.

EDWIN DIXON,

WOLVERHAMPTON PATENT WROUGHT-IRON TUBE WORKS,
Originally established in 1833,

Manufacturer of Gas and other Tubes, Fittings, and articles of every description belonging to Gas, Water, or Steam.

E. D. had the honour of receiving the
PRIZE MEDAL
warded to this Manufacture by the COUNCIL of the GREAT ENGLISH EXHIBITION of 1851; and from he latter date has supplied many towns exclusively with GALVANIZED and other Tubes for Gas and Water, under GOVERNMENT ENGINEERS.

A City, containing 150,000 inhabitants,
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Large Stocks generally on hand, averaging from one to three hundred thousand feet.

HYDRAULIC PRESS TUBES,
to resist 6000 lbs. and upwards to the square inch, extensively manufactured.

STOCK DIES and SCREWING TACKLE
of the best possible description.

Every Tube carefully tested with Hydraulic Pressure before leaving the Works.

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Manufactory—Broad Street, Birmingham—Established 1807,

MANUFACTURERS OF GLASS CHANDELIERS, GLASS LUSTRES, TABLE GLASS, &c. &c.

ELEGANT CRYSTAL GLASS CHANDELIERS, for GAS, from £4 upwards (Made from "REGISTERED" DESIGNS), with GLASS BRANCHES, &c.; suitable for DRAWING-ROOMS and BALL-ROOMS. The more extensive use of GAS in private dwellings has induced Messrs. OSLER to direct their particular attention to the manufacture of this class of articles—which, with a view to their general adoption, are offered at very moderate prices. Purchasers can select from a great variety of patterns, to which additions are being constantly made.

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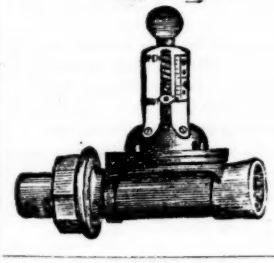
Established 1830.



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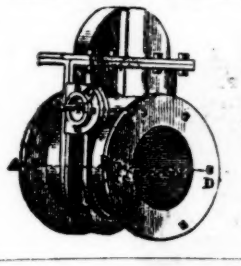
MANUFACTURERS OF

Wrought-Iron Welded Tubes and Fittings,

FOR GAS & HIGH-PRESSURE WATER & STEAM.



BRYAN DONKIN & CO.

keep always on stock their

IMPROVED GAS VALVES

from 2 inches to 18 inches, price 11s. 6d. to 13s. 6d. per inch diameter

List of prices, with full dimensions of all sizes up to 27 inches, to be had on application.

These Valves are all proved to 30 lbs. on the square inch before leaving the works.

BRYAN DONKIN & CO.,

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NEAR GRANGE ROAD, BERMONDSEY.

FIVE HUNDRED HOLMAN'S PATENT DOUBLE-ACTION PUMPS

Prove their general adaptation. They are adopted by

CIVIL, MARINE, MANUFACTURING, AND MECHANICAL ENGINEERS.

For Pumping TAR, AMMONIACAL LIQUOR, WATER, WORT, and other fluids, their intrinsic excellence is too well known to need description.

S. HOLMAN tenders his hearty thanks to all Patrons, and is prepared to undertake the Supply of Towns, Public and Private Establishments, and Irrigation of Lands, on any scale.

Sole London Agent of the Williams's Perran Foundry Company, for the Sale of Cornish Pumping, Winding, and other Steam-Engines, heavy Machinery, Castings, and Forgings.

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IRON MERCHANT AND AGENT,

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Wholesale and Retail Charcoal and Coke Dealer, and Grinder,

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ALL GOODS KEPT IN STOCK, AND SUPPLIED AT MANUFACTURERS PRICES.

Cast-Iron Socket, Flanch, Hot Water-Pipes and Connexions, for Gas, Water, and Steam purposes, Rain-Water-Pipes and Guttering, &c. Furnace-Pans and Stable-Fittings. Retorts, Hydraulic Main, Furnace-Work, &c. Lamp-Columns. Lanterns, Cocks and Burners, Wrought-Iron Tubing, &c., of best description. Screw-Cocks, Sluices, and Gas-Valves of every description. Bar, Rod, Plate, and Hoop-Iron Bolts and Nuts. Cast-Iron Columns, Girders, Street-Posts, Watering-Posts, Gutters, Gratings and Railing-Bars, Tank-Plates, and Pump-Castings. Engine, Mill, and Lathe Castings. Planing, Turning, and Boring executed. Cast-Iron Pans, for Soap and Chemical Works. Galvanized Cast-Iron Jars and Pots, for Sugar Refiners. Stourbridge and Newcastle Fire-Bricks, Retorts, Lumps, Tiles, and Clay. Malleable Iron Castings. Pipe-Laying by Contract. Double-Refined Machinery Oil. Iron Borings. Salammoniac and Sulphur.

Castings made in Town or Country, on the shortest notice, to Sketches, Drawings, or Patterns.

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For Gas, Water, Steam, and General Purposes, and

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CONSULTING ENGINEER,

PATENTEE OF THE VERTICAL OVEN RETORT

No. 367, PERSHORE ROAD,

BIRMINGHAM.

JAMES OAKES and CO.,

ALFRETON IRON WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 20, WHARF ROAD, CITY ROAD, LONDON,

Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including best cold-blast Iron Retorts, Socket and Flange Pipes of all sizes, Bends, Branches, Syphons, Lamp Columns of various patterns, &c.

N.B.—Orders for Cast-iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention.

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C. H. is prepared to carry out the warming and ventilation of public buildings, &c.; also civil engineering in general.

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Manufactory for every description of Casting and Machinery for Gas Works and Water Works.

Warehouse in London for Cast-iron Pipes and Connections of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

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Wrought and Cast Iron Pipes, Cast-Iron Retorts, and all kinds of Foundry Work necessary for Gas-Works. Fire-Bricks and Clay Retorts. Gas Coals of every description. Pig, Bar, and Plate Iron.

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Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, T-pieces, &c. &c.

Plans, Specifications, and Estimates prepared.

GAS Stoves, Gas Baths, Gas Cooking

APPARATUS, warranted the best in England at PHILLIPS'S, the original inventor and manufacturer, and general gas-fitter, &c., 55, Skinner Street, Snow Hill, LONDON, E.C.

PATENT SAFETY ATLAS CHANDELIERS, Sun and Star Burners, Outside Lamps, Patent Reflecting Lamps, Portable Coppers for either Gas or Fuel. Iron Tube and Fittings. Best quality for Gas, Steam, or Hot Water, &c. &c.

STOURBRIDGE FIRE-CLAY WORKS.

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Every article manufactured at their own Works and Mines, Brierley Hill.

FIRE-BRICKS, Lumps, Squares, Tiles, and Gas Retorts of all dimensions.

CRUCIBLE and CEMENT CLAYS.

GARDEN EDGINGS, of various patterns.

BUFF and ORNAMENTAL TILES.

CLINKERS and STABLE PAVINGS, noted for hardness and durability, being perfectly non-absorbent.

Shipments on the shortest notice.

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DEEPDALE FIRE-CLAY & BRICK WORKS,

Near DUDLEY,

Manufacturer of every description of Fire-Bricks, Lumps, Quarries, Shields, Flue Covers, &c., to any size or shape required.

FIRE-CLAY RETORTS,

TO MODEL OR DRAWING.

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R. LAIDLAW & SON,

GAS ENGINEERS, IRON & BRASS FOUNDERS,

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GLASGOW;

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MANUFACTURERS OF

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WROUGHT-IRON TUBES, FOR GAS, WATER, & STEAM; CAST-IRON RETORTS & PIPES;

HYDRAULIC MAINS, CONDENSERS, WASHERS, SCRUBBERS, PURIFIERS, & TANKS.

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WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of

RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,

beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO.—Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

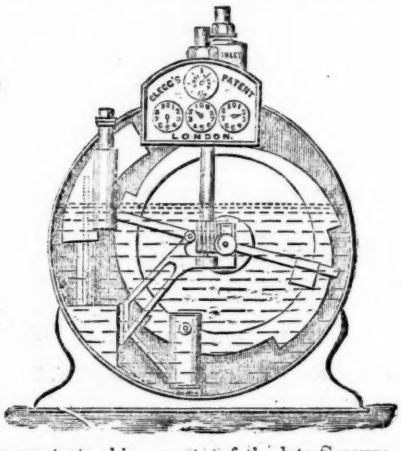
CLEGG'S
NEW PATENT HYDRAULIC GAS-METER.

BISCHOFF, BROWN, & CO.,

MANUFACTURERS

AND

SOLE LICENSEES,



LANGHAM WORKS,

GEORGE STREET,

GREAT PORTLAND STREET,

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This Meter is the last and one of the greatest achievements of the late SAMUEL CLEGG, C.E., in his connexion with the Manufacture and use of Gas, and, without presumption, it may be confidently affirmed to be the only Meter extant that can be relied upon to measure correctly, to work with the minimum of pressure, and steadiness of light. It cannot be tampered with by tilting or otherwise, and will be of great durability.

This Meter is constructed on an entirely new principle, and, when once adjusted, will always remain the same under all circumstances. The quantity or height of the water in it has no effect on its *capacity*. The immense importance and economy of this to Gas Companies who are obliged to employ so many inspectors, is so obvious, that they will be able to appreciate its advantages over all othe Wet Meters, where the varying height of the water regulates the capacity.

The Drum, from its peculiar construction, presents scarcely any resistance when moving through the water; and, its weight being taken off its axis by an air vessel, it revolves with the slightest pressure.

The comparative absence of friction in the Drum reduces the wear and tear, and enables it to be made of the strongest materials, which will keep it in working order longer than any other Meter.

It is approved and adopted by the principal London and Country Gas Companies, and is guaranteed to comply with the "Sale of Gas Act," as this Meter, beyond all doubt, works within a shorter range of registration than any other Meter manufactured.

CROSLEY & GOLDSMITH'S

PATENT SELF-ADJUSTING & COMPENSATING GAS-METERS

CANNOT BE OVER OR UNDERCHARGED WITH WATER,

and they consequently register the quantity of Gas consumed with greater accuracy than Meters in which the Water-Line is va riable

MANUFACTURED BY

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(Late CROSLEY & CO.,)

GAS-METER MANUFACTURER,

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N.B. The Patent Self-Adjusting and Compensating Apparatus may be applied to the ordinary Meter.

Manufacturer of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night.

Also, Manufacturer of EXPERIMENT METERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c., &c., similar to those used by Mr. King, of Liverpool.

I. BRIGGS is also prepared to supply Gas Companies and others with

DUPLICATES of Mr. KING'S CUBIC FOOT TRANSFERRER,

similar to that manufactured by Crosley & Co., and verified by the ASTRONOMER-ROYAL, and PROFESSOR MILLER, of Cambridge, on behalf of the Government, which was deposited by them in the Office of the COMPTROLLER-GENERAL of the EXCHEQUER, before Nov. 13, 1859, in compliance with the "Act for Regulating Measures used in Sales of Gas." He also supplies

TEST GASHOLDERS,

Graduated by the Standard Cubic Foot.

TRUSS'S PATENT ELASTIC PIPE-JOINT,

FOR GAS AND WATER-MAINS, AND STEAM PIPING,

Is the only PERFECT joint that has ever been constructed, and supplies the long-felt desideratum, by allowing for the expansion and contraction of metals, and for oscillation and deflection, without impairing the joint. Gas Companies will effect an incalculable saving in adopting it, as compared with the present imperfect mode of jointing.

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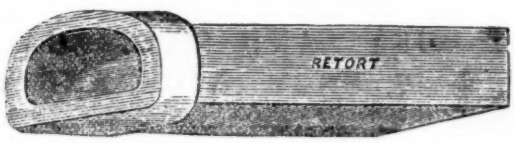
KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.



KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Burs, Flues, and Quarries, are all Manufactured of the same quality of Clay.

Every Retort and Brick is branded "King Brothers, Stourbridge."

FIRE-CLAY GAS RETORTS.

ESTABLISHED IN 1795.

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WORTLEY FIRE-BRICK WORKS, near LEEDS.

THESE RETORTS are unrivalled in excellence, being the BEST FINISHED INTERNALLY, and THE MOST CORRECT IN FORM, of any in the Kingdom. From the peculiar composition used in working up the face of the material, they are rendered unusually smooth, close, and FREE FROM SURFACE CRACKS, thus, in a great measure, preventing leakage and the adhesion of carbon to their interior surface.

To meet the yearly increasing demand of UPWARDS OF THIRTY SEASONS and to carry out the late improvements in the manufacture, the Premises have been re-erected and much enlarged, and Engineers may rely WITH CONFIDENCE on their orders being completed with a greater regard to despatch than by any other House.

THE WORKS ARE WELL SITUATED

For EXPORT from the Ports of { LONDON, LIVERPOOL, HULL, MIDDLESBRO', HARTLEPOOL, and STOCKTON.

FIRE-BRICKS, LUMPS, GUARDS, TILES, AND CLAY OF THE SAME QUALITY.

M. P. NEWTON, London Agent, No. 4, Wharf, King's Cross Goods Station.

MESSRS.

CROLL, RAIT, AND CO.,

Manufacturers of Croll's Patent Improved

DRY GAS-METER,

Are prepared to supply their Meters duly stamped, under the authority of the Sale of Gas Act, 22nd and 23rd Vic., Cap. 66.

Fees for Stamping charged on Invoice.

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MANUFACTURER OF

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Of the best material and workmanship, carefully adjusted to meet the requirements of the SALES OF GAS ACT.

STATION-METERS & GOVERNORS,

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EXPERIMENTAL TESTING APPARATUS,

Employed by the best experimenters in this country and on the continent, and by the Gas Testers in the London districts.

PHOTOMETERS, SPECIFIC GRAVITY APPARATUS, BI-SULPHURET OF CARBON TEST, THOMPSON'S BROMINE AND HEATING-POWER OF FUEL TESTS, IMPROVED ALKALIMETER, EXPERIMENTAL METERS AND GOVERNORS, MINUTE CLOCKS, &c., &c.

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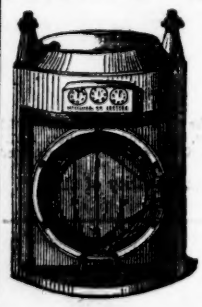
ESTABLISHED 1836.



J. M. invites attention to his Improvements in EXPERIMENTAL WET GAS-METERS, by which he renders impossible any Leakage from the Stuffing-Box.

These METERS are GUARANTEED to meet all the Requirements of the SALE OF GAS ACT

GOVERNORS, STATION-METERS, PHOTOMETERS,

EXPERIMENTAL TESTING GASHOLDERS, HIGH-PRESSURE GAUGES,

AND ALL APPARATUS IN USE AT THE GAS MANUFACTORY.

D. HULETT and CO., 55 and 56, HIGH HOLBORN, LONDON,

PATENTEES and MANUFACTURERS of the ONLY GOOD MERCURIAL GAS REGULATOR,

invite the attention of Gas Companies and the Trade generally to their Improved GAS-METERS, which they warrant equal to any in Quality, Workmanship, and Simplicity of Construction, and the only Meters from which Gas cannot be obtained without being duly registered.

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GAS CHANDELIERS, GLASS LUSTRES, HALL LANTERNS, VESTIBULES, BRACKETS, PENDANTS;

DOUBLE CONE, ALBERT, SHADOWLESS, & EVERY DESCRIPTION OF BURNER, UNION JETS, BATSWINGS, ETC.;

IMPROVED FULL-WAY CARTER'S VALVES (much approved of);

GAS-STOVES, and every article connected with Gas Apparatus.

CAST & WROUGHT-IRON PIPE BLACK & GALVANIZED. COPPER. TIN, BRASS, & COMPOSITION TUBING.

D. HULETT'S IMPROVED SERVICE CLEANSER

for clearing out Mains, Services, and Interior Fittings—60s. net.

Boyle's Patent Silvered Glass Combination Reflectors and Outside Lanterns.

Sole Manufacturers of Church and Mann's Photometer.

Large Pattern Books, with every description of Gas-Fittings, Chandeliers, &c., with complete Book of Prices, 12s.

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